

OPEN ACCESS



Journal of  
**Economics and  
International Finance**

January-March 2020  
ISSN 2006-9812  
DOI 10.5897/JEIF  
[www.academicjournals.org](http://www.academicjournals.org)



**ACADEMIC  
JOURNALS**  
expand your knowledge

# ABOUT JEIF

The **Journal of Economics and International Finance (JEIF)** is published monthly (one volume per year) by Academic Journals.

**Journal of Economics and International Finance (JEIF)** is an open access journal that provides rapid publication (monthly) of articles in all areas of the subject such as econometrics, trade balance, Mercantilism, Perfect competition etc. The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published shortly after acceptance. All articles published in JEIF are peer-reviewed.

## Contact Us

**Editorial Office:** [jeif@academicjournals.org](mailto:jeif@academicjournals.org)

**Help Desk:** [helpdesk@academicjournals.org](mailto:helpdesk@academicjournals.org)

**Website:** <http://www.academicjournals.org/journal/JEIF>

**Submit manuscript online** <http://ms.academicjournals.me/>

## Editors

**Prof. Nathalie Jeanne-Marie HILMI**

*Professor of Economics and Finance,  
International University of Monaco,  
Hedge Funds Research Institute,  
98000 Monte-Carlo, Principality of, Monaco.  
France*

**Prof. Osamah M. Al-Khazali**

*Professor of Finance,  
School of Business and Management  
American University of Sharjah,  
P.O. Box 26666,  
United Arab Emirates,*

**Dr. Guneratne B Wickremasinghe**

*School of Accounting  
Faculty of Business and Law  
Victoria University  
Melbourne  
Victoria, 8001.  
Australia*

**Dr. Meltem Gürünlü**

*Department of Economics and Finance  
University of Turin,  
G.Prato,  
Italy.*

**Prof. Yongrok Choi**

*Department of International Trade,  
Inha university,  
Incheon,  
Korea.*

**Prof. Mohamed Osman Ahmed Bushara**

*Department of Agricultural Economics;  
FAS; Gezira University; P. O. Box 20; Wad Medani;  
Sudan.*

**Prof. Anyanwu John Chukwudi**

*Development Research Department  
African Development Bank  
15 Avenue du Ghana  
BP 323, 1002 Tunis Belvedere  
Tunis  
Tunisia*

**Prof. S. E. Neaime**

*Department of Economics,  
Institute of Financial Economics,  
American University of Beirut,  
Beirut,  
Lebanon.*

**Dr. Adrei Vernikov**

*Banking Department,  
Higher School of Economics  
P.O. Box 43,  
Moscow 125057,  
Russia.*

**Prof. Keith Pilbeam**

*Department of Economics,  
City University,  
Northampton Square,  
London EC1V OHB.  
UK.*

## Editorial Board

**Dr. Gbadebo Olusegun ODULARU**

*Regional Policies and Markets Analyst,  
Forum for Agricultural Research in, Africa (FARA),  
PMB CT 173 Cantonments, 2 Gowa Close, Roman Ridge,  
Accra, Ghana.*

**Dr ilhan Ozturk**

*Çağ University, Faculty of Economics and Administrative,  
Sciences, Adana - Mersin karayolu, uzeri, 33800,  
Mersin ,Turkey.*

**Professor. Abdelkader BOUDRIGA**

*Professor of finance,  
School of Economics and Commerce,  
Tunis, Tunisia.*

**Dr. Shivakumar Deene**

*Dept. of Commerce and Management,  
Karnataka State Open University,  
Manasagangotri,  
Mysore- 570 006,  
Karnataka - India.*

**Mohammed Omrán**

*The Egyptian Exchange, 4 (A) El, Sherifein St, Down, Town,  
Postal Code 11513,  
P.O. Box 358 Mohammed Farid,  
Cairo, Egypt.*

**Dr. Kola Subair**

*Adjunct Professor, Business and, Financial Economics,  
American Heritage University,  
California, USA.*

**Dr. Bora Aktan**

*Assistant Professor of Finance,  
Yasar University,  
Faculty of Economics and, Administrative Sciences,  
Department of Finance,  
Selcuk Yasar Campus,  
Universite Caddesi, No. 35-37,  
35100 Bornova, Izmir,  
Turkey.*

**Dr. Davide Furceri**

*Office of the Chief Economist,  
Economics Department,  
2, Rue André-Pascal,  
75775 Paris Cedex 16,  
France.*

**Dr. ABDUL JALIL**

*Wuhan University,  
Economics and Management School,  
Wuhan,Hubei,  
PR China.*

**Prof. Silvia Ciotti**

*Dept of Social and Environmental Sciences,  
St. John International University,  
Della Rovere Castle - Rey Square,  
10048 - Vinovo (Turin),  
Italy.*

**Prof. Tessaleno Devezas**

*Advanced Materials and Technological, Forecasting,  
University of Beira Interior,  
6200-001 Covilhã,  
Portugal.*

**Dr. Nikolay Sukhomlin**

*Autonomous University,  
Santo Domingo,  
Dominican Republic.*

**Prof. Dev Tewari**

*Deputy Dean, Faculty of Management Studies  
Professor, School of Economics and Finance,  
Westville Campus, University of KwaZulu-Natal  
Resource Economics, Durban, 4001.  
South Africa.*

**Dr. Tarek Chebbi**

*Faculty of Law, Economics and Political Science  
University of Sousse,  
Erriadh City - 4023 Sousse,  
Tunisia*

**Professor Hichri Walid**

*Gate & Uiversity of Lyon, LAREQUAD  
Gate, 93 Chemin des mauilles, 69130 Ecully  
France.*

**Dr.Sunderasan Srinivasan**

*Navillu Road 7th Cross, Kuvempunagar,  
Mysore 570023,  
India.*

**Dr. P. Malyadri**

*Government degree College,Osmania University  
Tandur-501141,Rangareddy District  
India.*

# Table of Content

<b>Causal links between foreign direct investment and import demand in ECOWAS Countries: A view through meta-analysis</b> Keho Yaya	1
<b>The role of internal auditors to implement IFRS9: Case of Lebanese banks</b> Oussama Chedid and Jamil Chaya	6
<b>Market opening and economic growth in Nigeria</b> Ogbebor Peter Ifeanyi, Okolie Onyeisi Romanus and Siyanbola Trimisiu Tunji	20
<b>Temperature-based options for Vietnam: An option pricing and policy insight</b> TRAN Do Thinh Hoang and OTAKE Toshitsugu	29
<b>The impact of money laundering in beautiful places: The case of Trinidad and Tobago</b> Lester Henry and Shanice Moses	39

*Full Length Research Paper*

# **Causal links between foreign direct investment and import demand in ECOWAS Countries: A view through meta-analysis**

**Keho Yaya**

Ecole Nationale Supérieure de Statistique et d'Economie Appliquée (ENSEA) 08 BP 03 Abidjan 08, Côte d'Ivoire.

Received 2 December, 2019; Accepted 29 January, 2020

**This study examines the relationship between Foreign Direct Investment (FDI) and import demand for 11 member countries of the Economic Community of West African States (ECOWAS) during the period 1970-2017. We employ a causality test based on Meta-analysis which considers the issues of cross-sectional dependency and slope heterogeneity among countries. The empirical findings indicate that the causal nexus between FDI and imports is one way running from imports to FDI. The results also reveal heterogeneity across countries in the causal nexus between FDI and imports. There is no evidence of causality between the two variables for seven countries while there is unidirectional causality from FDI to imports for two countries, and from imports to FDI for two countries.**

**Key words:** imports, foreign direct investment, Granger causality, cross-sectional dependency, Economic Community of West African States (ECOWAS).

## **INTRODUCTION**

Foreign direct investment is an important instrument of economic development, especially for the developing countries facing a large resource gap. It enables them to build up physical capital and enhance skills of local labor through transfer of technology and managerial practices. On the other hand Foreign Direct Investment (FDI) help developing countries integrate into the global economy. In this way, FDI inflows affect the balance of payments of the host countries. In this study, we investigate the link between FDI and imports for 11 member countries of the Economic Community of West African States (ECOWAS). The relationship between FDI and imports is a debated topic in the economic literature. On the theoretical ground, there may exist a two-way causal relationship between

FDI and imports. First, if imports are viewed by investors as evidence of existence of a profitable market, FDI might be attracted to the host country. On the other hand, FDI can influence imports both at the initial investment and operation phases. At the initial investment phase, FDI industries import capital and intermediate goods that are not produced in the host country. This contributes to increase imports and deteriorate the trade balance. At the operation phase of the investment, if FDI industries use local inputs of production, they may not have significant effect on imports. On the contrary, if they rely on imported inputs to satisfy the quality standards required by the world market, they will increase the demand for imports (Hailu, 2010).

E-mail: [yayakeho@yahoo.fr](mailto:yayakeho@yahoo.fr).

Author(s) agree that this article remain permanently open access under the terms of the [Creative Commons Attribution License 4.0 International License](https://creativecommons.org/licenses/by/4.0/)

On the empirical side, a number of studies have explored the link between FDI and imports. However, the empirical evidence is quite mixed and inconclusive. Some studies support the existence of a causal relationship between FDI and imports (Liu et al., 2001; Dritsaki et al., 2004; Pacheco-Lopéz, 2005; Iqbal et al., 2010) while others fail to support it (Lin, 1995; Kiran, 2011; Chantha et al., 2018). The empirical approaches examining the nexus between FDI and imports are based on times series and panel data methods. A major problem with panel data analyses is the implicit assumption that countries share common characteristics. This is likely to not be true given differences not only in institutional and economic structures of countries but also in their reactions to external shocks. Another shortcoming of these studies is that they assume cross-sectional independence across countries. This assumption is panel country-specific characteristics. Therefore, in this study unlikely to hold because countries of a panel may be linked one to another. Thus, the estimates from standard data regression methods are potentially misleading because

$$M_{it} = \alpha_{1i} + \sum_{j=1}^{k_i} \beta_{1ij} M_{it-j} + \sum_{j=1}^{k_i} \gamma_{1ij} FDI_{it-j} + \sum_{j=k_i+1}^{k_i+d \max_i} \beta_{1ij} M_{it-j} + \sum_{j=k_i+1}^{k_i+d \max_i} \gamma_{1ij} FDI_{it-j} + \mu_{1it} \quad (1)$$

$$FDI_{it} = \alpha_{2i} + \sum_{j=1}^{k_i} \beta_{2ij} M_{it-j} + \sum_{j=1}^{k_i} \gamma_{2ij} FDI_{it-j} + \sum_{j=k_i+1}^{k_i+d \max_i} \beta_{2ij} M_{it-j} + \sum_{j=k_i+1}^{k_i+d \max_i} \gamma_{2ij} FDI_{it-j} + \mu_{2it} \quad (2)$$

where  $d \max_i$  is maximal order of integration of variables for each country  $i$ .

Once this augmented level VAR is estimated, a standard Wald test is applied to the first  $k_i$  parameters to make causal inference. For example, the null hypothesis that FDI does not Granger cause imports (M) is:  $\gamma_{1ij} = \dots = \gamma_{1iki} = 0$  for  $i=1, \dots, N$ . Under the null hypothesis, the individual Wald statistics have an asymptotic chi-square distribution with  $k_i$  degrees of freedom. We use Fisher (1932) test statistic to make causal inference at the panel level. This test combines several  $p$ -values of identical and independent tests as follows:

$$\lambda = -2 \sum_{i=1}^N \ln(p_i) \quad (3)$$

where  $p_i$  is the  $p$ -value corresponding to the Wald statistic of the  $i$ -th individual panel unit. This test statistic has a chi-square distribution with  $2N$  degrees of freedom.

The limit distribution of the Fisher test statistic is not valid in the presence of cross-section dependency. To deal with such inferential problem, we follow the bootstrap methodology suggested by Emirmahmutoglu and Nezir (2011) to generate empirical distribution of Fisher test statistic. For simplicity, we focus on testing

they ignore cross-sectional dependence and we use panel data estimation method that accommodates with both cross-sectional dependence and heterogeneity.

## MODELING FRAMEWORK

To test for Granger causality between FDI and imports, this study employs the modified-Wald test proposed by Toda and Yamamoto (1995). This method is more efficient in small sample data sizes and is particularly appropriate for time series for which the order of integration is not necessarily the same or the order of integration is more than one. Another advantage is that it does not require the pre-testing of the time series for co-integration. This is important since the unit root and the co-integration tests in general suffer from low power and different tests often lead to conflicting results. The basic idea of the Toda and Yamamoto (1995) causality approach is to intentionally over-fit the level VAR model by extra lags. Thus, the model VAR to be estimated in this study is specified as follows:

causality from FDI to imports (M) in Equation 1. The steps of the bootstrap procedure proceeds as follows:

Step 1: We determine the maximal order of integration of variables for each country, using the PP test of Phillips and Perron (1988).

Step 2: We estimate Equation 1 by OLS for each country and select the optimal lag length  $k_i$  through the Akaike Information Criteria (AIC) by starting with  $k=4$  and applying a top down strategy.

Step 3: By using  $k_i$  and  $d \max_i$ , from Steps 1 and 2, we re-estimate Equation 1 by OLS under the null hypothesis ( $\gamma_{1i1} = \gamma_{1i2} = \dots = \gamma_{1iki} = 0$ ) and obtain the residuals for each individual.

$$\hat{\mu}_{1it} = M_{it} - \hat{\alpha}_{1i} - \sum_{j=k_i+1}^{k_i+d \max_i} \hat{\beta}_{1ij} M_{it-j} - \sum_{j=k_i+1}^{k_i+d \max_i} \hat{\gamma}_{1ij} FDI_{it-j} \quad (4)$$

Step 4: We select randomly a full column with replacement from the matrix at a time to preserve the cross covariance structure of the error-terms. We denote the bootstrap residuals as  $\hat{\mu}_{1it}^*$ .

Step 5: We generate the bootstrap sample of import variable M under the null hypothesis:

**Table 1.** Descriptive statistics of the variables.

Country	FDI (% GDP)				M (% GDP)			
	Mean	Std.	Min.	Max.	Mean	Std.	Min.	Max.
Benin	1.388	1.447	-0.422	5.979	32.864	4.543	24.461	43.958
Burkina Faso	0.799	1.210	-0.119	5.073	26.339	3.873	16.141	37.160
Cote d'Ivoire	1.384	0.974	0.160	6.013	34.685	5.032	25.906	44.745
Gambia	2.740	3.234	-2.809	12.549	43.922	12.889	25.108	71.582
Ghana	2.268	3.089	-0.508	11.152	32.399	17.479	2.982	67.246
Mali,	1.388	1.763	-0.706	7.350	31.660	5.747	18.201	42.718
Niger	2.651	4.469	-1.438	16.629	29.307	7.997	15.601	49.091
Nigeria	1.476	1.149	-0.372	4.859	14.058	5.659	3.029	23.922
Senegal	1.215	1.146	-1.285	3.784	36.457	5.676	26.424	51.780
Sierra Leone	2.870	6.420	-14.531	32.302	30.890	12.057	12.405	64.450
Togo	1.923	3.311	-7.030	18.386	49.128	11.190	25.829	76.881
Panel	1.828	3.097	-14.531	32.302	32.883	12.667	2.982	76.881

Note: Std. denotes standard deviation.

$$M_{it}^* = \hat{\alpha}_{1i} - \sum_{j=k_i+1}^{k_i+d \max_i} \hat{\beta}_{1ij} M_{it-j} - \sum_{j=k_i+1}^{k_i+d \max_{ii}} \hat{\gamma}_{1ij} FDI_{it-j} + \hat{\mu}_{it}^* \quad (5)$$

where  $\hat{\alpha}_{1i}$ ,  $\hat{\beta}_{1ij}$ , and  $\hat{\gamma}_{1ij}$  are the estimations from Step 3.

Step 6: Substitute  $M_{it}^*$  for  $M_{it}$  and estimate Equation 1 without imposing any parameter restrictions on it and then the individual Wald statistics are calculated to test non-causality null hypothesis separately for each country. Using these individual Wald statistics which have an asymptotic chi-square distribution with  $k_i$  degrees of freedom, we compute individual *p-values*. Then, the Fisher test statistic given by Equation 3 is obtained.

We generate the bootstrap empirical distribution of the Fisher test statistics repeating Steps 4-6 many times and compute the bootstrap critical values by selecting the appropriate percentiles of these sampling distributions.

Our methodology has three advantages. It allows the lag orders on autoregressive coefficients and exogenous variable coefficients to vary across countries. Furthermore, it accommodates both for heterogeneity and cross section dependency.

## DATA AND EMPIRICAL RESULTS

To carry out the empirical investigation, this study uses annual time series data of inward FDI and imports (M) for a panel of 11 ECOWAS member countries. According to the World Bank, FDI refers to the net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise, operating in an economy other than that of the investor and can be further developed as the sum of equity capital, reinvestment of earnings, other long term capital, and short-term capital as shown in the balance of payments in

that economy. The data cover the period from 1970 to 2017. Foreign direct investment and imports are measured as share of Gross domestic product (GDP) so as to eliminate the effects of economic growth and prices. The countries under study include: Benin, Burkina Faso, Cote d'Ivoire, The Gambia, Ghana, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo. The selection of countries and time periods is limited by data availability. Data were obtained from the World Development Indicators of the World Bank. Table 1 outlays the summary statistics for the variables. This table reveals a disparity in FDI and imports among ECOWAS countries. The average import penetration rate varies from 14.058% in Nigeria to 49.128% in Togo. Inward FDI as share of GDP varies from 0.799% in Burkina Faso to 2.870% in Sierra Leone.

Before applying the Granger causality tests, the presence of cross-sectional dependence in the error terms of Equation 1 was tested. It has been demonstrated that neglecting cross-sectional dependence could cause bias and inconsistent results (Breusch and Pagan, 1980; Bai and Kao, 2006; Pesaran, 2006; Kapetanios et al., 2011; Sarafidis and Wansbeek, 2012). The results of the cross-sectional dependence tests are presented in Table 2. This table also reports the results of the slope homogeneity tests based on Swamy (1970) test and the delta tilde and adjusted delta tilde tests developed by Pesaran and Yamagata (2008). The results strongly indicate that the null hypothesis of no cross-sectional dependence is rejected at the 5% level of significance. The cross-sectional dependence tests thereby support evidence of high connection among the ECOWAS countries, which implies that any shock that occurs in one country can quickly be transmitted to other countries. The results also support country-specific heterogeneity, implying that the direction of causal linkages between FDI and imports may differ across countries.



**Table 2.** Cross-sectional dependence and homogeneity tests.

Test	Statistic	<i>p</i> -value
Cross-sectional dependence test		
Breusch-Pagan LM	67.339	0.122
Pesaran CD	1.666	0.095**
Pesaran scaled LM	1.176	0.239
Homogeneity test		
Delta	194.302	0.000*
Delta adjusted	206.876	0.000*
Swamy test	3018.011	0.000*

\* and \*\* indicate significance at the 5 and 10% levels, respectively.

**Table 3.** Unit root test.

Country	FDI	M	$\Delta$ FDI	$\Delta$ M	dmax <sub>i</sub>
Benin	0.024*	0.013*	0.000*	0.000*	0
Burkina Faso	0.165	0.014*	0.000*	0.000*	1
Cote d'Ivoire	0.017*	0.163	0.000*	0.000*	1
Gambia	0.105	0.284	0.000*	0.000*	1
Ghana	0.757	0.628	0.000*	0.000*	1
Mali	0.019*	0.007*	0.000*	0.000*	0
Niger	0.364	0.197	0.000*	0.000*	1
Nigeria	0.130	0.092**	0.000*	0.000*	1
Senegal	0.008*	0.017*	0.000*	0.000*	0
Sierra Leone	0.027*	0.199	0.000*	0.000*	1
Togo	0.000*	0.053*	0.000*	0.000*	0
Panel	0.000*	0.053*	0.000*	0.000*	0

Notes: The values presented in Table are p-values. \* (\*\*) indicates the rejection of the null hypothesis of unit root at 5% (10%) significance level.

As a second step of our empirical analysis, we test for the order of integration of the series by using the PP test of Phillips and Perron (1988). This step is necessary to determine the maximal order of integration of variables for each country. The test results are reported in Table 3. According to the results all the variables are stationary in four countries while they are integrated of order one for the remaining countries.

Based on these results, the next step is to test for the existence of causal relationships between the two variables. The existence of cross-sectional dependency and heterogeneity across countries makes the use of standard Granger causality tests inappropriate. The results of Granger causality test based on Toda and Yamamoto (1995) procedure are reported in Table 4. They show that both the null hypothesis of “no causality from FDI to imports” and “no causality from imports to FDI” cannot be rejected for seven countries. On the other hand, there is strong evidence of unidirectional causality running from FDI to imports for Ghana and Niger, while the reverse causality is supported for Mali and Togo. For the panel as a whole the results suggest that the causal

link between FDI and imports is one way running from imports to FDI.

## Conclusion

In this study, we have investigated the causal relationship between inward foreign direct investment and imports in 11 ECOWAS countries. The data set comprises annual data on FDI and imports as share of GDP for a period spanning from 1970 to 2017. The study applied the Granger causality testing approach suggested by Toda and Yamamoto (1995) in heterogeneous mixed panel by using a Meta-analysis. We found that there are strong correlations among the ECOWAS countries. Therefore, we have applied the bootstrap method to generate the empirical distribution of the Fisher test. The empirical findings indicate that the causal nexus between FDI and imports is one way running from imports to FDI. This suggests that FDI inflows to ECOWAS area are attracted by its foreign trade strategy. The results also reveal heterogeneity across countries in the causal nexus

**Table 4.** Granger causality test.

Country	$k_i$	Ho: FDI does not cause M		Ho: M does not cause FDI	
		Wald	$p_i$	Wald	$p_i$
Benin	1	0.241	0.623	2.273	0.131
Burkina Faso	1	0.512	0.474	1.305	0.253
Cote d'Ivoire	1	0.142	0.705	0.928	0.335
Gambia	1	0.394	0.530	0.073	0.785
Ghana	4	11.977*	0.017	6.772	0.148
Mali	1	1.060	0.303	2.730**	0.098
Niger	1	5.169*	0.023	1.596	0.206
Nigeria	2	2.521	0.284	0.626	0.731
Senegal	2	0.608	0.738	0.816	0.664
Sierra Leone	1	1.309	0.252	0.832	0.361
Togo	4	1.199	0.878	19.829*	0.0005
<b>Fisher test (<math>\lambda</math>)</b>		<b>28.632</b>	<b>0.155</b>	<b>39.797*</b>	<b>0.011</b>

Lag orders  $k_i$  are selected by minimizing the AIC criteria. The asterisks \* and \*\* denotes the rejection of the null hypothesis at the 5 and 10% significance levels, respectively.

between FDI and imports. There is no evidence of causality between the two variables for seven countries while there is unidirectional causality from FDI to imports for two countries (Ghana and Niger), and from imports to FDI for two countries (Mali and Togo). These findings suggest that foreign direct investment would not deteriorate the trade balance of most of ECOWAS countries.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

## REFERENCES

- Bai J, Kao C (2006). On the Estimation Inference of a Panel Cointegration Model with Cross-Sectional Dependence. In: Baltagi, Badi. (Ed.), Contributions to Economic Analysis. Elsevier, pp. 3-30.
- Breusch TS, Pagan AR (1980). The Lagrange Multiplier Test and its Application to Model Specification in Econometrics. *Review of Economic Studies* 47(1):239-253.
- Chantha H, Keo K, Suttiprapa C (2018). An Empirical Analysis of Cambodia's Import Demand Function. *Journal of Management, Economics, and Industrial Organization* 2(1):1-12.
- Dritsaki M, Dritsaki C, Adamopoulos A (2004). A Causal Relationship between Trade, Foreign Direct Investment and Economic Growth for Greece. *American Journal of Applied Sciences* 1(3):230-235.
- Emirmahmutoglu F, Nezir K (2011). Testing for Granger Causality in Heterogeneous mixed Panels. *Economic Modelling* 28:870-876.
- Fisher RA (1932). *Statistical Methods for Research Workers*. 4<sup>th</sup> Edition. Oliver and Boyd, Edinburgh.
- Hailu Z (2010). Impact of Foreign Direct Investment on Trade of African Countries. *International Journal of Economics and Finance* 2(3):122-134.
- Iqbal MS, Shaikh FM, Shar AH (2010). Causality Relationship between Foreign Direct Investment, Trade and Economic Growth in Pakistan. *Asian Social Science* 6(9):82-89.
- Kapetanios G, Pesaran M, Yamagata T (2011). Panels with Non-stationary Multifactor Error Structures. *Journal of Econometrics* 160(2):326-348.
- Kiran B (2011). Causal Links between Foreign Direct Investment and Trade in Turkey. *International Journal of Economics and Finance* 3(2):150-158.
- Lin A (1995). Trade Effects of Foreign Direct Investment: Evidence for Taiwan with Four ASEAN Countries. *Weltwirtschaftliches Archiv* 131:737-747.
- Liu X, Wang C, Wei Y (2001). Causal Links between Foreign Direct Investment and Trade in China. *China Economic Review* 12(2-3):190-202.
- Pacheco-López P (2005). Foreign Direct Investment, Exports and Imports in Mexico. *World Economy* 28(8):1157-1172.
- Pesaran MH (2006). Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica* 74(4):967-1012.
- Pesaran MH, Yamagata T (2008). Testing Slope Homogeneity in Large Panels. *Journal of Econometrics* 142(1):50-93.
- Phillips PCB, Perron P (1988). Testing for a Unit Root in a Time Series Regression. *Biometrika* 75(2):335-346.
- Sarafidis V, Wansbeek T (2012). Cross-Sectional Dependence in Panel Data Analysis. *Econometric Reviews* 31(5):483-531.
- Swamy P (1970). Efficient Inference in a Random Coefficient Regression Model. *Econometrica* 38(2):311-323.
- Toda HY, Yamamoto T (1995). Statistical Inference in Vector Regressions with possible Integrated Processes. *Journal of Econometrics* 66(1-2):225-250.

*Full Length Research Paper*

# **The role of internal auditors to implement IFRS9: Case of Lebanese banks**

**Oussama Chedid and Jamil Chaya\***

Department of Financial Studies, Faculty of College of Business Administration, Rafik Hariri University, Lebanon.

Received 22 August, 2019; Accepted 29 January, 2020

**The implementation of IFRS9 as with any structural change to accounting policies requires a strategic development and implementation, and a concerted effort from many departments. This paper investigated the role of internal auditors at Lebanese banks in the implementation of accounting standards. The local banking system is surveyed in a targeted manner to test for significant shortcomings in the ideal strategic implementation of IFRS 9 by internal auditors. This is done by constructing a tailored survey based on the defined role of the internal auditor by regulatory agencies, external auditors, and by international standards with special attention to IFRS 9. The findings suggested that internal auditors in Lebanon did perceive themselves as having the required knowledge for the implementation and on the other hand would have benefited from an implementation plan with an emphasis on strategic synergies between key departments. In a final note, the study found that the implementation of IFRS 9 could find a value added strategic role of the internal auditor if the process of feedback and control started at the front office.**

**Key words:** Internal audit, audit function, IFRS 9, implementation, Lebanon.

## **INTRODUCTION**

The Norwalk Agreement of 2002 between the International Accounting Standard Board (IASB) and the US Financial Accounting Standard Board (FASB) was intended to converge International Financial Reporting Standards (IFRS) and US Generally Accepted Accounting Principles (USGAAP). The ambition of the project turned out to be more difficult than anticipated and the agreement slowly progressed. Most significant in these changes was the standardization of revenue recognition, insurance, financial instruments, and leases (Bakertilly, 2014). After the 2008 financial crisis and the

criticisms from users of financial statements and external auditors, work was accelerated in order to address the accounting issues which hid some of the pre-crisis signs especially the timeliness of expected credit losses recognition. As a result, in July 2014, the final version of a new accounting principle for financial instruments was created, and became effective as of January 2018 (early adoption was allowed) (IFRS, 2014a, b).

The rising complexity and timely implementation of the new standards pushed local and international regulators to give internal auditors a more important role within

\*Corresponding author. E-mail: [chayaj@protonmail.ch](mailto:chayaj@protonmail.ch).

financial institutions. Traditionally internal auditors are perceived as independent consultants within the institution who provide assurances which add value, manage risk and improve operations, controls, compliance and governance processes. This being said, given the findings of this study, it is advocated that the role of internal auditors should also encompass strategic organizational alignment.

The aim of this paper was to investigate the role of internal auditors at select Lebanese banks in the implementation of accounting standards. The role is defined by the Basel Committee on Banking Supervision Guidance (Bank of International Settlements, June 2012) and was amended to include post 2008-financial crisis practices. Independence, competency, supervisory role all increased significantly in this amended definition. The implementation of IFRS9 has significantly altered optimal banking operation; in this regard, internal auditors must be made strategic actors in the development of strategic operational plans with the goal of increasing profitability, reducing risk, and avoiding the costly repercussions of this implementation.

To accomplish this, several fundamental questions have been identified:

1. Is the role of the internal auditor clearly defined and understood within the Lebanese banking sector?
2. How do regulators perceive the role of internal auditors in Lebanese banks?
3. Is the role of internal auditor segregated from other functions?
4. Are internal auditors knowledgeable in the implementation of IFRS9?
5. Is the internal audit function strategic or supportive in the Lebanese banks? If strategic, where can it add value?

To address these questions, this paper seeks to:

1. Assess the role of internal auditors in the implementation of IFRS 9.
2. Identify the key responsibilities of the internal auditors and the value added that can be created.
3. To provide the national audit body with insight into its implementation.

## LITERATURE REVIEW

### International standards

To promote confidence in the local financial system and to comply with international standards, the Banque du Liban (BdL) [or the Central Bank of Lebanon] institutionalized the implementation of IFRS 9 in the local financial sector. The application and the monitoring of IFRS 9 is one way to regain investors' confidence that has deteriorated as a result of the financial crises (Beerbaum, 2017). This standard was implemented

effective as of the 1st of January 2018 in all countries that follow the International Auditing Standards Board; and it has significant impacts on the financial industry. The newly implemented IFRS 9 will replace IAS 39, and will change banking operations materially (Carrasco, 2015). All financial institutions in Europe, MENA region, Asia, Oceania, and Africa will change the way they are calculating their impairment, provisions, and financial reporting (Ibid).

In terms of definition, IFRS 9 defines how an organization would "measure and classify its financial assets, liabilities, and methods to do their contracts to sell or buy non-financial items" (IFRS, July 2014). Financial assets are measured based on the entity's business model and based on the "contractual cash flow" characteristics. Hence, they are either measured at amortized cost, fair value through profit and loss, or fair value through other comprehensive income. Upon any change made to the business model, the entity has to adjust the classification of the financial assets. Impairment of financial assets is recognized in stages, and is determined based on the level of the credit loss.

IFRS 9 also identifies a framework for measuring financial liabilities. (IFRS, July 2014) They are either measured at amortized cost or at fair value through profit and loss such as derivatives and hedging instruments, especially for those held for trading purposes. It is obligatory to reclassify financial liabilities upon initial recognition only. Entities cannot reclassify them at a later stage. On the other hand, IFRS 9 specifies special provision considerations for three types of hedging instruments such as "fair value hedge", "cash flow hedge", and "net investment of foreign operation". However, entities are allowed to follow IAS 39 for hedging requirements while applying IFRS 9.

Contrary to widespread belief, IFRS 9 not only affects financial institutions. The aim of this standard is to reduce income statement volatility through measuring more assets and liabilities at fair value. It also aims for the early detection of any possible impairment or predicted future credit loss. Some entities will be highly affected by the consequences of this standard. For example, loans in banks are subject to this risk, so these institutions have to consider the possible credit loss even if it is most likely that this loan will be collectible (Price Water Cooper, 2017). The newly required disclosures will help banks optimize their balance sheet and improve their reporting, which will cut costs (Ibid). This standard brings financial stability in addition to other intended benefits and consequences (Institute of Chartered Accountants in England and Wales, 2018).

IFRS 9 goes beyond the work of accounting to impact the entity's systems and processes. It is not only an accounting change, but a challenge for the organization as a whole (Deloitte, 2017). This paper seeks to assess the critical role of Internal Auditors in the Implementation of IFRS 9. In doing so, a discussion of the key

responsibilities of the Internal Audit function and then explore areas where value can be added. This study aims to obtain empirical evidence from the Lebanese banking system, as this topic is still new and evolving. Lebanese banks are obliged by the Central Bank of Lebanon (BdL), and regulatory bodies to implement this standard as of the 1st of January 2018. By this contemporaneous nature, we intend to provide the national audit body with an insight into its implementation. To achieve this aim, a mix research approach of quantitative and qualitative analysis is used. 45 surveys were distributed to concerned parties about the implementation of IFRS 9 across the diverse banks operating in Lebanon. Moreover, seven in-depth interviews were conducted to explore the contemporary implementation of this new standard in terms of improvements and difficulties faced.

### **Role of Internal Audit in IFRS9 implementation at banks**

Due to expanding of internal audit responsibilities and in order to achieve skillfully its traditional role by providing objective assurance and consulting activities to the management of the organization in the intent to improve organization operations, the internal audit should enhance its value preservation role and develop a role in value creation by helping management in assessing risks, improving control system, and comply with required rules and regulations (KPMG, 2007).

Internal auditors help their organizations to succeed by enhancing systems design, assessing business models, and providing consulting activities in the sake of improving efficiency and effectiveness of entity operations. Expanding internal audit duties enforce auditors to develop their risk-based audit plan to incorporate automated preventive audit that help enhancing control and lowered costs. Internal auditors should develop their skills and knowledge's to become heavily finance focused in order to meet the recent requirements of accounting standards (Ibid).

The Bank of International Settlements (BIS) released a publication of the role of internal auditors in banks according to the Basel Committee (Bank of International Settlements, 2012). Internal auditors are responsible for providing independent, objective assurance and consulting activity designed to add value, improve and evaluate the effectiveness of risk management, internal control, and governance process in the organization, and are required to abide by local regulations and international standards such as those issued by the Institute of Internal Auditors (IIA). They should use a risk based approach to determine their Audit plans, and must report their findings to management (for instance, Board of Directors in the bank) and to the audit committee and senior management. According to principle 7 reported in this publication, internal auditors have to "ensure proper coverage of matters of regulatory interest within the audit

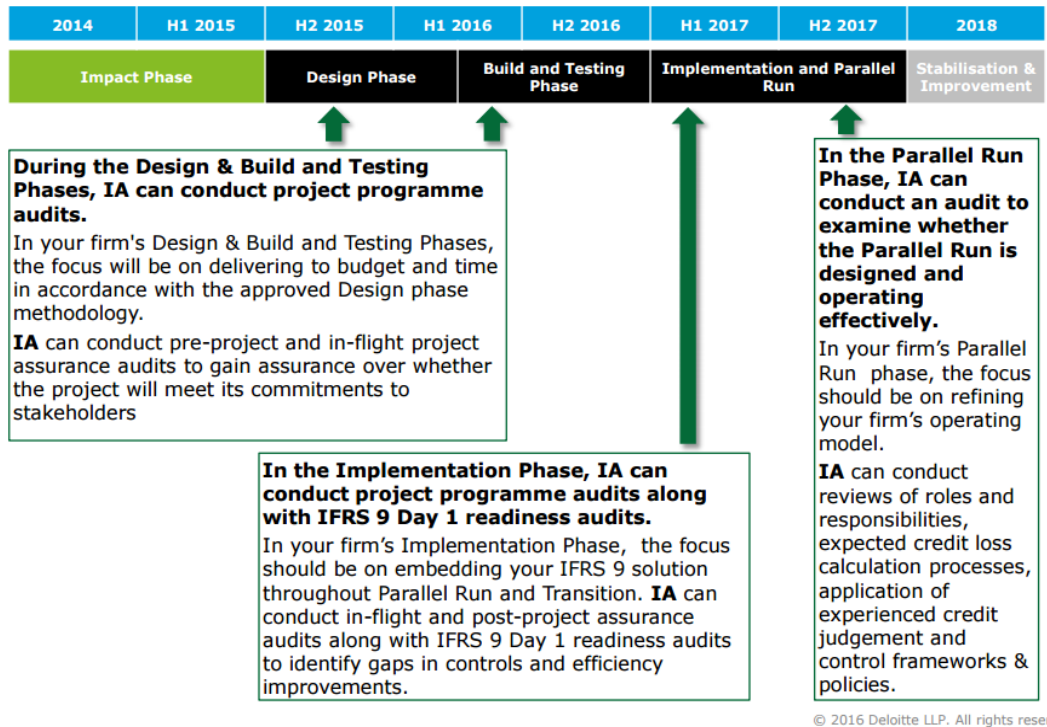
plan." They have to respond to key risk management issues and adhere to the regularity requirements as depicted in Exhibit 1:

According to the Institute of Internal Auditors, internal auditors are requested by definition to do the following: (Deloitte, 2016),

- 1) "Assure the presence of assets and advise on the proper safeguards to protect them.
  - 2) Examine the soundness of the internal controls system;
  - 3) Recommend enhancements for these controls;
  - 4) Examine "compliance with policies and procedures and sound business practices";
  - 5) Assess compliance with laws and regulations.
  - 6) Review operations and programs and check whether they are being carried out as planned and reported;
  - 7) Investigate the occurrence of any possible fraud and other types of illegal and unethical acts such as "embezzlement, theft, waste, etc..."
- Figure 1 depicts a mapping of how internal auditors are engaged in the different phases of implementation.

Deloitte considers that internal auditors are responsible to assess the availability and quality of data sets that will be used in Expected Credit Loss (ECL) calculations (Ibid). They should review the developed methodologies and models to make sure management is making unbiased and timely estimates. Moreover, they should evaluate practicing strong governance and control to help the bank in achieving the objectives of IFRS 9.

Actually, the globalization of banking operations and financial markets has increased the role of internal audit in evaluating reliable information and in improving sound corporate governance (Ester and Garcia-Perez de Lema, 2012). The Sarbanes-Oxley Act has released several codes related to governance as they found a strong relationship between the quality of governance and protection of users' interests (Callao et al., 2007). In the Spanish banking industry, new regulatory framework requested internal control to new guidelines for their internal audit functions (IAF) by issuing acts related to finance, transparency, governance, audit and sustainable economy; and enhanced recommendations for more reliable financial reporting (Aldama, 2003). Internal control has a critical role in their monitoring of proper financial reporting. They have a day-to-day role that maintains quality of management actions as well as external auditors' work. The importance of this role was tested with and without the presence of internal controls (Prawitt et al., 2009). Results proved that sound IAF revealed an environment that is free from fraudulent financial reporting, and reduced the presence of errors by detecting them earlier prior to the external audit work. In the literature, there is limited discussion about the role of internal audit in the implementation of IFRS 9 as our topic is new; but in general, there is a proven relationship between IAF and external auditing, and IAF and financial reporting (Ester and Garcia-Perez de Lema, 2012).



**Figure 1.** Phases of Implementation.  
Source: Deloitte (2016).

## Relationship between internal and external audit

Internal auditors must understand the operational as well as the financial aspects of their entity (Martin and Lavine, 2000). Increased understanding and effectiveness in their work leads to cost savings as this will reduce external audit work. Usually, external auditors examine the soundness of the bank's internal controls in their planning phase; and the better the controls, the less audit procedures need to be performed, which eventually decreases the external auditing budget (Krishnamoorthy, 2000). Krishnamoorthy added that when examining their work, external auditors should check the competence, objectivity, and work done by internal auditors, keeping in mind that knowledge of the international accounting standards is an essential component of their competency grade.

In the scope of the study, when internal auditors are knowledgeable about IFRS 9, they are competent and less effort will be made by external auditors which would reduce cost. If they are not applying this standard and verifying its proper implementation by the bank's management, this will be reflected in the external auditor's report, and incurs losses to the bank from different perspectives. The American Institute of Certified Public Accountants (AICPA) requests this coordination among both parties for a complete audit report, and eliminates the possibility of duplicate efforts (Ester and Garcia-Perez de Lema, 2012).

## Internal auditors and financial reporting

Financial reporting is not the sole responsibility of the internal audit function; internal auditors play a vital role in early fraud detection (Committee of Sponsoring Organizations of the Treadway Commission, n.d.). The latter are considered the most knowledgeable parties in the entity in the scope of operational activities. Several studies have proved how they perform analytical tests to avoid irregularities in transactions of high inherent and control risk (Spira and Page, 2003; Sarens and De Beelde, 2006). However, there remains the possibility that as internal parties, internal auditors would misreport the compliance and irregularities done by management for certain incentives (Asare et al., 2008). In an overview of the role of internal auditors in financial reporting, and according to Internal Audit standards, internal auditors have two roles in reporting - strategic and operational.

The operational role involves:

- 1) "Being engaged in setting the policies and procedures that enhance the planning and organizing of internal audit operations.
- 2) Complying with the risk management framework to review their work and its impact on financial reporting.
- 3) Supervising administrative acts such as budgeting, HR practices, etc. to be well directed.
- 4) Proper technical interviewing before hiring internal auditors, which has an indirect impact on the accuracy of

financial reporting.

5) Reporting on the risk management application and procedures to senior management, as minutes of meeting regarding these issues will be used by external auditors when auditing the financial reports of the bank.

6) Maintaining a proper Quality Assurance Improvement Program to ensure better reporting”.

The strategic role involves (Internal Audit Standards from the Certified Internal Audit Program, 2018):

1) “Coping with changes, and being the catalysts for new changes to financial reporting.

2) Networking with the audit committee and executives.

3) Working as a collaborative team on business process enhancements.

4) Maintaining a proper ethical environment and investigating any ethical dilemma to assess its impact on financial reporting.

4) Educating superiors and senior management on best practices of management and compliance.

5) Communicating findings and key performance indicators with senior management and making them available to those who need them.

6) Coordinating their efforts as internal auditors with external auditors and regulatory bodies.

7) Assessing the bank’s performance in meeting corporate objectives and maintaining an adequate performance system.”

### IFRS9 implementation at Lebanese banks

In light of persistent global economic stagnation and regional political-economic turmoil BdL has resorted to financial engineering policies as part of its monetary policy objectives (Banque du Liban, 2016; 2017). Following an operation to acquire reserves from the banks in return for purchasing holdings of Lebanese Pound (LBP) denominated debt at prices including large capital gains for the banks (known as the “financial engineering”), international reserves reached almost US\$44 billion. This covers 100% of short-term debt and the IMF reserve adequacy metrics. Banks have been asked to retain part of the profits from this transaction to meet capital requirements stemming from the adoption of IFRS 9, planned for 2018 (World Bank, 2016).

Furthermore, and in order to meet the IFRS9 requirements and Pursuant to the Code of Money and Credit, notably Articles 70, 146, 174, and 182, BdL issued Basic Circular No.143 addressed specifically to the banks, financial institutions, and external auditors. Exhibit 2 shows a summary of the aforementioned circular.

### METHODOLOGY

This research used a mix research approach of quantitative and

qualitative analysis. Quantitative analysis is performed utilizing a survey questionnaire. In fact, 45 surveys were distributed to concerned parties about the implementation of IFRS 9 across a sample of banks operating in Lebanon while qualitative analysis is performed based on seven in-depth interviews conducted to explore the contemporary implementation of this new standard in terms of improvements and difficulties faced.

A questionnaire designed around professional qualifications, roles and responsibilities, to assess the status of IFRS9 implementation according to internal auditors was developed and distributed to local commercial banks (Appendix A). In addition, guided interviews were conducted with members of regulatory bodies to identify the perceived role of IFRS 9 implementation by external bodies on the proper and adequate implementation and the role of the internal auditors (Appendix B). The results from the research are novel and unique in nature and can serve as a guide in the continued application and transition to regulatory requirements and the vital role played by internal auditors.

Sampling was non-probabilistic, rather convenient, as it targeted internal auditors in majority selected number of the local banks; 42<sup>1</sup> such questionnaires were distributed. Five comprehensive interviews were conducted with the heads of internal audit departments at five alpha banks. One interview was conducted with the head of the banking risk assessment group at the Banking Control Commission of Lebanon. One interview was conducted with an external auditor from the big four international auditing firms (EY, KPMG,PWC, Deloitte).

It must be noted at this point that no statistical measure beyond a simple mean per question and category is taken because of the nature of the survey. The survey was designed to gauge the landscape and contrast the results to the well-defined role of the internal auditor.

The role of internal auditors was segmented into four distinct categories under which questions were developed to quantify the perception of internal auditors with regard to those roles. These categories were derived from the definitions of roles from the IIA, Basel committee, IFRS, national regulators:

- 1) Audit model and risk processing
- 2) Development, validation, and approval
- 3) Specification and design
- 4) Implementation and monitoring.

The results from these categories would be compared to the actual expectations from regulators, the IIA, and the head of the internal audit departments. We expect that these roles effectively absorbed by the internal auditors, the results of the survey should display this integration as perceived by the respondents.

## RESULTS AND DISCUSSION

### General

81.8% of the respondents were between the ages of 35-45 and 62.2% male, and 46.7% holds a masters degree. A third of the respondents have less than 5 years of experience with their employer, and the remaining 67% have over 5 years of experience. 60% of respondents are members of the IIA Lebanon Chapter. 87% self-report having knowledge of IFRS 9 yet 22% report that the

<sup>1</sup> Arab Bank, Bank Audi, BBAC, BLC, BML, Bank of Beirut, Blom Bank, Blominvest, Capital Finance Company, First National Bank, Fransabank, Lebanon and Gulf Bank, Middle East Capital Group, National Bank of Kuwait, SAMBA Bank, SGBL.

internal audit department does not have a role in the implementation of IFRS9 as it would be a conflict of interest and the role of the internal auditor would come at a later stage. Furthermore, 51.1% of the respondents observed that their respective banks did not coordinate the role of the internal audit department and that of financial control and risk within the implementation of IFRS9. 88.9% of interviewees believe that the internal audit department has the needed capability to complete their work.

### **Role 1: Audit Model and Risk Processing**

58% of the respondents are using internally developed Expected Credit Loss (ECL) Models. 68% of the banks are using the advanced approach with regards to ECL. Both results might suggest an advanced understanding of the IFRS9 implementation.

84.4% of respondents believed that the internal audit function should assess the design and methodology used to calculate ECL. This result is satisfactory as it is in line with the expected role of the internal auditors. It is possible that the remaining 15% of respondents believe that ECL modeling requires advanced expertise under the purview of the risk and IT departments.

91% of the respondents believed that the internal audit department should test the accuracy, completeness, and reliability of data incorporated into the risk model. Thus, a major consensus among internal auditors in Lebanon that in general, they understand their responsibilities in this regard was observed. The 9% whom are neutral may represent those not implementing the standard, or implementing it without proper knowledge and understanding. These banks should enhance the internal audit awareness by encouraging them to participate in training programs related to the topic.

93% of the respondents believe that the internal audit function at the bank should test the implemented model's consistency with the approved model. It should be noted that the main role of the internal audit is to evaluate and improve the effectiveness of governance process and banking systems in addition to ensuring that IT support and coordination with bank departments is effective and efficient. In that end, 84% of the respondents believed that the internal audit function played an important role in testing the effectiveness of IT support.

In regards to the perceptions of internal auditors in their role of testing ECL models to provide objective results and reporting, and whether there is ongoing monitoring for the whole process, all but one respondent were in agreement that this role is to be assigned to the internal audit function, as testing objectivity and ongoing monitoring of the whole process of IFRS 9 are non-negotiable. The process is on an ongoing basis, rather than a one-time ECL calculation or a one-time test for classification and measurement of assets and liabilities. This is critical for external auditors who base their audit

procedures on the extent of work done by internal auditors. The lack in testing and monitoring should push external auditors to perform extensive procedures as they will not be able to depend on internal controls within the bank (Grant, 2017).

With respect to model sophistication and its consistency with the portfolio of assets, the respondents in our survey were 75% in agreement with the role of internal auditors to ensure this consistency. It is of the mind of the remaining respondents that the sophistication of the portfolio is one at the managerial strategy level.

### **Role 2: Design documentation**

Internal auditors should ensure that design documents for model development and usage include appropriate interpretations of IFRS 9 requirements (Basel Committee on Banking Supervision, February 2015). 84% of the respondents did hold this belief, however, the remaining 16% indicate a variance in the way internal auditors deal with the implementation of this standard. This also demonstrates that auditors who did not answer questions regarding the implemented approach and the chosen model, whether simplified or advanced, did also disagree that the internal auditors should make sure that the design documents include appropriate interpretation of IFRS 9 requirements. However, making sure that the documentation of the entire project are available and contain the appropriate explanation regarding the standard is one of the essential roles of internal auditors; and the failure to apply is considered a weakness that must be addressed. Furthermore, 11% of the respondents did not have an opinion in regards to credit risk process within the design documentation. The major aim of this standard is to construct a proper ECL model that helps to expect future credit default and providing against it, in order to mitigate losses. It is the basis for the provision to be taken either at initial recognition or at further stages. Therefore, neutrality reflects a major gap among few internal auditors in Lebanon. However, 84.5% reflected that they are concerned about these crucial interpretations.

The use of forward looking information implied by the Lifetime Expected Credit Losses (unlike single period ECL) within the design documents is fundamental for a well-designed approach. Hence, of the 89% of the respondents in agreement, it is believed they are better equipped to deal with risk, provisions, and losses. The same percentage in agreement believes that the internal audit function needs to include the principles and assumptions underlying the calculations derived in the design documents. This documentation is important for regulators and external auditors.

### **Role 3: Governance**

The internal audit function has a non-negotiable role to



comply with governance standards as it would impose the bank to be fined and sanctioned. It may also expose the credibility of the internal audit resulting in a lack of public confidence. The central bank sets the required system of operation for the whole internal audit body, and they are requested to apply it adequately in all of its aspects. In this regard, all but one respondent was in agreement. In the same spirit, internal auditors must ensure the existence of a formal policy to review and approve the design of models before going live.

Design documentation must be applied in the development process, and it is the role of the internal auditor to ensure that management control processes are in place. In this vein, 96% of the respondents were in agreement.

#### Role 4: Data

Internal auditors should ensure that data selection is accurate, reliable, and not manipulated. This data is specifically used in the ECL estimations and could be used to decrease provisions (Leventis and Anandarajan, 2011). In this role, 91% of the respondents were in agreement. To accomplish this, internal auditors should make sure the internal control framework is in place for data governance. 96% of the respondents were in agreement. Forward looking estimates must also be audited for accuracy and consistency, in this regard, 80% of the respondents were in agreement. In regards to high risk models, an independent validation unit is requested by the standard yet only eighty-two percent of respondents were in agreement.

Data is also collected on the model performance itself using Key Performance Indicators (KPIs) for monitoring. 76% of the respondents were in agreement. This is indicative that almost a quarter of the sample has not started monitoring the implementation of IFRS 9 using KPIs. However, this has to be done in the near future as KPIs give the internal auditors as well as bank management strong insights into the consequences of this implementation in order to be able to take proper corrective actions in advance.

#### RECOMMENDATION

Within the framework documentation, data, compliance, and model methodology constructed in this paper to assess the role of the internal auditor in the implementation of IFRS in Lebanon in the fiscal year 2018, it can be concluded that internal auditors within banks self-report to have sufficient knowledge and capacity to implement IFRS 9. Any self-perceived shortcoming in the implementation in regards to roles and responsibilities they should perform can be explained by a lack of experience and may be addressed by further

training and mentoring from within the bank.

IFRS 9 implementation did require a concerted effort from the credit, Information Technology (IT), and internal audit department. In this regard, the development and formalization of an audit program may have ensured a more successful coordination across departments and a strategic alignment of implementation, all while conscious of conflicts of interest that may arise. This could have augmented the efficacy of the following bank functions with respect to the dramatic changes caused by IFRS 9:

- 1) Portfolio strategy: strategic loan duration, collateral quality, borrower profile
- 2) Lending policies: emphasis on short term loans and early redemption
- 3) Credit risk assessment: improve early warning system, increase monitoring
- 4) Credit policy: introduce new risk limits, improve the link between bank risk appetite and loan agents
- 5) People management: change incentive policy and performance metrics, provide trainings.

#### CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

#### REFERENCES

- Aldama (2003). Informe de la Comisión Especial para el Fomento de la Transparencia y Seguridad en los Mercados y en las Sociedades Cotizadas. Madrid: Aldama Report.
- Asare S, Davidson R, Gramling A (2008). Internal auditors' evaluation of fraud factors in planning an audit: the importance of audit committee quality and management incentives. *International Journal of Auditing* pp. 181-203.
- Bakertilly (2014). Progress report: International convergence of accounting standards. Retrieved from <https://www.bakertilly.com/insights/progress-report-international-convergence-of-accounting-standards/>.
- Bank of International Settlements (2012). Basel Committee on Banking Supervision: The Internal Audit Function in Banks.
- Bank of International Settlements (2012). Basel Committee on Banking Supervision: The Internal Audit Function in Banks. Basel: BIS.
- Banque du Liban (2016). Banque Du Liban's Financial Engineering: Background, Objectives, and Impact. Retrieved from <http://www.bdl.gov.lb/downloads/download/210/en>
- Banque du Liban (2017). Basic Circular No 143 Addressed to Banks, Financial Institutions, and External Auditors. Retrieved from [http://www.bdl.gov.lb/files/circulars/143\\_en.pdf](http://www.bdl.gov.lb/files/circulars/143_en.pdf)
- Basel Committee on Banking Supervision (2015). Guidance on Accounting for Expected Credit Losses. Consultative Document, Bank for International Settlements.
- Beerbaum P (2017). IFRS 9 for financial institutions - the case for IFRS and FinRep-taxonomies – a conceptual gap analysis. *Journal of Accounting, Finance, and Auditing*, pp. 80-90.
- Callao GS, Gasca GM, Jarne JJ (2007). Gobierno corporativo y deficiencias de la información contable. *Spanish Accounting Review*, pp.133-156.
- Carrasco C (2015). IFRS 9 Will Significantly Impact Banks' Provisions and Financial Statements. *Moody's Analytics*.
- Committee of Sponsoring Organizations of the Treadway Commission. (n.d.). Report of the National Commission on Fraudulent Financial

- Reporting. Retrieved from <https://www.coso.org/Pages/NCFRR-Summary.aspx>
- Deloitte (2016). IFRS 9 – What is involved and what are the implications for Internal Audit? Retrieved from Chartered Institute of Internal Auditors: <https://www.iaa.org.uk/media/1688755/7-alana-sainsbury-ifrs9-financial-instruments-what-is-involved-and-what-are-the-implications-for-iapptx.pdf>
- Deloitte (2017). Deloitte. Retrieved from Perspectives: [https://www2.deloitte.com/content/dam/Deloitte/xe/Documents/About-Deloitte/mepovdocuments/mepovissue24/ifrs-9\\_mepov24.pdf](https://www2.deloitte.com/content/dam/Deloitte/xe/Documents/About-Deloitte/mepovdocuments/mepovissue24/ifrs-9_mepov24.pdf)
- Ester G, Marin-Hernandez S, Garcia-Perez de Lema D (2012). Internal audit and financial reporting in the Spanish banking industry. *Managerial Auditing Journal* pp.728-753.
- Grant T (2017). Global Public Policy Committee: Considerations for the Audit of Expected Credit Losses The Auditor's response to the risks of material misstatement posed by estimates of expected credit losses under IFRS 9 Global Public Policy Committee.
- IFRS (2014). IFRS 9 Financial Instruments. Retrieved from <https://www.ifrs.org/issued-standards/list-of-standards/ifrs-9-financial-instruments>
- Institute of Chartered Accountants in England and Wales. (2018). IFRS 9: What it Means for Banks and Financial Stability. ICAEW.
- KPMG (2007). The evolving role of the internal auditor- value creation and preservation from an internal audit perspective
- Krishnamoorthy G (2000). A cascade inference model for evaluation of the internal audit report. *Decision Sciences* 32(3):499-520.
- Leventis S, Dimitropoulos P, Anandarajan A (2011). Loan Loss Provisions, Earnings Management and Capital Management under IFRS: The Case of EU Commercial Banks. *Journal of Financial Services Research* 40:103-122.
- Martin C, Lavine M (2000). Outsourcing the internal audit function. *The CPA Journal*, pp. 58-70.
- Prawitt D, Smith J, Wood D (2009). Internal audit quality and earnings management. *The Accounting Review* 84(4):1255-1280.
- Price Water Cooper (2017). IFRS 9 Financial Instruments - Understanding the Basics. London: PWC.
- Sarens G, De Beelde I (2006). Internal auditors' perception about their role in risk management: A comparison between US and Belgian companies. *Managerial Auditing Journal* 21(1):63-80.
- Spira L, Page M (2003). Risk management: The reinvention of internal control and the changing role of internal audit. *Accounting, Auditing and Accountability Journal* 16(4):640-661.
- World Bank (2016). Lebanon-Financial Sector Assessment. Financial Sector Assessment Program. <http://documents.worldbank.org/curated/en/260481485486059075/Lebanon-Financial-Sector-Assessment>

**APPENDIX**

**Appendix A - Questionnaire**

**SECTION 1: GENERAL INFORMATION**

1. Gender  M  F  
 2. Age  25-34  35-45  45 and above  
 3. What is your highest academic qualification?  
 Diploma  Degree  Masters  
 other, specify \_\_\_\_\_  
 1. Name of the Bank you work for:

**2. How long have you been working in the aforementioned Bank?**

- Less than 5 years  Between 5-10 years  Between 11-20 years  
 Over 20 years

**1. How long have you been working in the audit department?**

- Less than 5 years  Between 5-10 years  Between 11-20 years  
 Over 20 years

**1. Are you a member of IIA- Lebanon chapter?**

- Yes  No

**2. Do you have an overall knowledge about IFRS9?**

- Yes  No

**3. Do you believe that the Internal Audit departments should assist in the implementation of IFRS9?**

- Yes  No

**4. Did the Internal Audit department in the above mentioned Bank play the role of coordinator between the concerned departments, mainly Financial Control and Risk Department, in the implementation of IFRS9?**

- Yes  No

**5. Did the Internal Audit department complete the IFRS9 audit?**

- Yes  No

**6. Do you think that the Audit Department has the needed capability and authority to finalize their work in an independent, efficient and proficient way?**

- Yes  No

**7. Regarding calculation of ECL, is the Model used internally developed?**

- Yes  No

**8. What is the model your bank is using to calculate ECL?**

- Simplified Approach  Advanced Approach

**9. Explain the advantages of the chosen approach?**

**SECTION 2: FACTORS AFFECTING AUDITORS' HIGH QUALITY PERFORMANCE**

**A.1 this is to determine if the Audit program content is effective, accurate and in line with international standards requirement.**

Please choose the most appropriate response whether you agree or disagree with the below statements. Use 1-5 as follow:

- 1- Strongly disagree 2- Disagree 3- Neutral 4- Agree 5- Strongly agree

<b>Audit the model and process risks</b>	<b>1 SD</b>	<b>2 D</b>	<b>3 N</b>	<b>4 A</b>	<b>5 SA</b>
<b>A.1.1.</b> The Internal Audit department should assess the design and the methodology used to calculate ECL.					
<b>A.1.2.</b> The Internal Audit department should test the accuracy, completeness and reliability of data incorporated into the risk model.					

A.1.3. The Internal Audit department should test that the implemented model is consistent with the approved model.					
A.1.4. The Internal Audit department should test that the model in place provides objective results and reporting, and there is an ongoing monitoring for the whole process.					
A.1.5. The Internal Audit department should test the effectiveness of IT support.					
<b>SPECIFICATION AND DESIGN</b>					
A.2.1. The Internal Auditors should make sure that design documents include appropriate interpretations of IFRS9 requirements.					
A.2.2. The Internal Auditors should make sure that design documents include appropriate credit risk processes.					
A.2.3 The Internal Auditors should make sure that design documents include complete and accurate forward looking information.					
A.2.4 The Internal Auditors should make sure that design documents include key principles on how calculations are determined.					
A.2.5. The Internal Auditors should make sure that the bank uses appropriate governance standards.					
A.2.6. The Internal Auditors should make sure that the bank is abiding by a formal policy to review and approve the design of models before going live.					
A.2.7. The Internal Auditors should make sure that the model approach is: <ul style="list-style-type: none"> <li>• Consistent with IFRS9</li> <li>• Reflecting the sophistication of the portfolio</li> <li>• Designed by experts</li> </ul>					
<b>DEVELOPMENT, VALIDATION AND APPROVAL PHASES</b>					
A.3.1. The Internal Auditors should ensure that the design documents are applied in the development process and that management control processes are in place.					
A.3.2. The Internal Auditors should make sure that the data selected is accurate and reliable, and cannot be manipulated.					

<p><b>A.3.3.</b> The Internal Auditors should make sure that an internal control framework is in place for data governance (assessing the data manipulated, and key parameters used in credit modeling).</p>					
<p><b>A.3.4.</b> The Internal Auditors should make sure that the forward-looking estimations are accurate and consistent.</p>					
<p><b>A.3.5</b> The Internal Auditors should make sure that an appropriate detailed testing for high risk models is being conducted by independent validation unit in order to test overall process, including:          1. Methodology used in development          2. Accuracy of the model used          3. Sources of data</p>					
<p><b>A.3.6</b> The Internal Auditors should make sure that there is a set of procedures to prevent data modification / manipulation without proper approval and documentation.</p>					
<p><b>IMPLEMENTATION AND MONITORING</b></p>					
<p><b>A.4.1</b> The Internal Auditors should make sure that the data used to calculate ECL is complete, accurate and reliable.</p>					
<p><b>A.4.2</b> The Internal Auditors should make sure the reporting process is approved and authorized.</p>					
<p><b>A.4.3</b> The Internal Auditors should make sure that the codes and parameters used can't be changed or manipulated.</p>					
<p><b>A.4.4</b> The Internal Auditors should make sure that the approved assumptions are correctly applied.</p>					
<p><b>A.4.5</b> The Internal Auditors should make sure that appropriate KPIs were selected to monitor model's performance.</p>					

**In your opinion, what are the other possible actions that Internal Auditors should take in order to enhance their role in the implementation of IFRS9?**

---



---

Thank you for your time

## Appendix B

### Summary of Interviews Conducted Internal Auditors

- There is no Audit Program prepared for IFRS9 implementation.
- Almost 50% of respondents said that they participated in the committee established for implementation of IFRS9, and the remaining interviewees consider this as a conflict of interest and the role of internal auditors become at a later stage before implementation.
- Most of them assured that the assumptions are reasonable and supportable and based on justifiable information.
- All of them assured that the methodology used is in accordance with IFRS9
- They assured that the collected historical data are sufficient and reliable.
- They checked all policies prepared for the implementation (credit rating policy, staging policy, impairment methodology, risk appetite, risk limits, percentage of each and every investment from the approved total investment).
- They also did the assessment of the business model (classification of investment).
- They reviewed the risk factors that affect the loans, and the criteria used to classify them and change this classification.
- They checked the ECL calculation and made sure that the formula used is within the approved scenario.

### Interview with Regulator

- There is no direct role of the Internal Audit Department in the implementation of IFRS9, but they encourage auditors to play the coordination role between concerned departments.
- It is a joint effort between Risk and Finance, the internal auditor may assist in the committee.
- The regulator asks internal auditor through BDL circular # 77 to check the policies and procedures for the entire bank operation, and no need to remind them about their role, and the regulator expects that the overall implementation is reviewed and assessed by the internal auditors in order to meet the IFRS9 requirements.
- The regulator doubt was about the conflict of interest faced in different local Lebanese banks, where the external auditor is the supplier who provides the software used in staging and calculating ECL.
- The regulator asks why banks used the PD/LGD methodology to calculate ECL? (Bearing in mind that this is beyond their responsibilities)
- The regulator did not oblige any bank to use any methodology, in their opinion IFRS9 is an accounting treatment and their role is concentrated regarding the way they organize the effect of this standard on banks profitability and equity.
- There is new circular that may be published later on, that is going to add stage I to tier 2 equity.

**Exhibit 1.** Key risk management issues.

a) **Risk Management:** Internal auditors have to ensure that the bank adheres to regulatory provisions and implements safe business practices by including in their scope of work actions related to credit concerns, interest rate risks, and liquidity issues, legal and operational risks. They have to assess risk tolerance and make sure that the bank abides by the approved risk appetite, and ensure a proper reporting of actions done by the risk management team. They also have to evaluate the processes performed by this team, their integrity, verify risk models, and approve the consistency and reliability of data used.

b) **Capital Adequacy and Liquidity:** As requested by international regulatory framework internal auditors have a major role in strengthening capital, and enhancing liquidity.

They should assess the adequacy of capital and ensure that the bank solvency is within Basel requirement. The Internal Auditor should also review management procedures to check, monitor and review the risk profile of the organization as referred to as an internal audit function and should fall under its umbrella.

c) **Regulatory and Internal Reporting:** This represents the responsibility of ensuring timely reporting and calculation of ratios especially ratios related to capital adequacy. The internal auditors are also responsible to make sure that the bank abide by Basel requirement regarding pillar 3 (market discipline) and issuing easily identifiable reports to users, they are also responsible to confirm that proper regulatory disclosures such as the guidelines on disclosure requirements on IFRS9 transitional arrangements and internal governance in order to enforce the importance of transparency and market self-restraint.

d) **Compliance:** The bank's compliance (operational, legal and AML compliance) should be assessed periodically by internal auditors who should promote the proper application of policies and procedures and encourage implementation of internal and external laws and regulations.

e) **Finance:** Internal auditors increase data accuracy and improve the reliability of financial statements; internal auditors take responsibility for evaluating calculation of some ratios, profit and loss estimation, and assessing the bank's practices. They

**Exhibit 2.** Circular No. 143.

- Article 1: All banks and financial institutions are obliged to start applying IFRS 9 and the amended version related to disclosures regarding financial instruments as of the effective date January 1, 2018. They should comply with this international financial reporting standard in all of their financial statements, both individual and consolidated.
- Article 2: Banks are requested to document their adoption to a business model that aligns with IFRS 9 requirements of financial assets and their corresponding contractual cash flows.
- Article 3: To sell financial instruments, the bank has to adopt a business model that has an objective that meets these cash flows and that allows them to do this trading. Otherwise, this transaction should be reported as exceptional.
- Article 4: To sell financial instruments, the bank has to follow the “derecognition” requirements of this standard, and to follow the market rules and market value. If the instrument is not listed, the bank should practice due diligence to assess its selling price.
- Article 5: Related specifically to the accounting department, and discusses methods of amortization of swap, its profits, and operations related to selling or buying financial instruments.
- Article 6: Discusses credit loss and corresponding provisions to be taken by the bank. Each is determined by the classification of the asset or liability, and any significant change in the related risk. In determining this risk, several approaches such as the “Historical Loss Approach”, or the approach based on both the “Probability of Default” and the “Loss Given Default parameters” can be adopted.
- Article 7: Discusses the way credit risk should be taken, and how it should be assessed periodically through a three stage process: performing assets & liabilities not exposed to risk, underperforming the latter that showed an increase in risk, non-performing credit impaired assets and liabilities into substandard, doubtful, and bad debts.
- Article 8, 9 & 10: Discusses the responsibility of the board of directors, audit committee, executive level management and risk management unit role in IFRS 9 implementations.
- Article 11: This article is the bedrock of our study as it discusses the role of the internal audit unit to independently assess the level of compliance with IFRS 9. It has to assess the proper implementation of the required policies and procedures, and those related to calculations of expected credit loss, specifically provisions. All of these should be performed as required by the standard.
- Article 12: Provisions on assets and liabilities should be taken in the currency of reporting on the (on and off balance sheets).
- Article 13: Banks should take the provisions based on the balance as at 31 December 2017. Collective provisions are to be taken on the surplus resulting from selling LBP financial instruments or the purchase of foreign currency ones.
- Article 14: If the reported amount of provisions regarding credit loss as of 1 January 2018 is below what is expected, it should be covered using the general reserve.
- Article 15: If the reported provisions balance exceeds what is expected, it should be reclassified to an account named “general provisions” or it may be transferred to the income statement; and all released provisions will be shown under the general reserve that will be discussed in the following article.
- Article 16: The bank should establish the account of general reserve based on the credit portfolio of performing loans rather than the retail ones. “Un-distributable General Reserve” should be transferred to “Un-distributable Retained Earnings”. The conversion of reserves taken in LBP to other currencies is prohibited.
- Article 17: The bank should take collective provisions on foreign currency credit losses under the account “foreign currency reserves”.
- Article 18: External auditors are requested to express their opinions about the bank’s implementation of IFRS 9.
- Article 19: The central bank should provide banks with models of balance sheets that show the provisions accounts and a guide for proper compliance. Article 20 and 21: This decision should come into effect upon issuance, and it should be published in the official gazette.

Source: (Banque du Liban, 2017).



*Full Length Research Paper*

# Market opening and economic growth in Nigeria

Ogbebor Peter Ifeanyi<sup>1\*</sup>, Okolie Onyeisi Romanus<sup>2</sup> and Siyanbola Trimisiu Tunji<sup>3</sup>

<sup>1</sup>Department of Banking and Finance, School of Management Sciences, Babcock University, Ilishan-Remo, Ogun State, Nigeria.

<sup>2</sup>Department of Accounting, Faculty of Management Science, Ambrose Alli University, Ekpoma – Edo State, Nigeria.

<sup>3</sup>Department of Accounting, School of Management Sciences, Babcock University, Ilishan-Remo, Ogun State, Nigeria.

Received 16 December, 2019; Accepted 5 February, 2020

**Market opening positively impacts economic growth due to reduction in the cost of capital and international risk diversification, amongst others in Nigeria. Using a robust set of econometric approach involving unit root test, co-integration, vector error correction model and granger causality, there is evidence that current value of economic growth responds to disequilibrium from past values of real gross domestic product, stock market development, foreign direct investment, trade openness, inflation and banking sector development in the long run. The result also shows that past values of real gross domestic product, foreign direct investment and trade openness promotes economic growth in the short run. The study, therefore, concludes that there are bi-directional causalities both in the short term and the long term between the dependent and explanatory variables. Based on the findings, the study recommends that policy makers in Nigeria should pay more attention to factors that can boost stock market development, foreign direct investment, trade openness, inflation and banking sector development in order to impact economic growth more positively in line with theoretical evidence that market opening positively impacts economic growth especially in frontier and emerging markets such as Nigeria.**

**Key words:** Inflation, market opening, trade openness.

## INTRODUCTION

The last few decades witnessed an increased interest on the effects of market opening on economic growth especially in the case of emerging markets. The literature is imbued with the positive effects of market opening on economic growth of countries and this became orchestrated following globalization of markets whereby all the economies of the world are integrated with one another through trade and free flow of capital among others.

With respect to financial markets, studies which herald the immense benefits that accrue to nations that open

their markets to the outside world include Levine (2001), Bekaert et al. (2003), and Ortiz et al. (2007) while the effectiveness of such openings underscores the need for reform programmes such as financial markets liberalization which gained currency in the 1980s and 1990s in the first place.

The over-view notwithstanding, there are some dissenting voices regarding the avowed benefits that accrue to countries with erstwhile closed markets that eventually liberalize. For example, Kim and Singal, (2000) and Stiglitz (2004), canvassed a completely different

\*Corresponding author. E-mail: [ogbebor.peter@yahoo.com](mailto:ogbebor.peter@yahoo.com). Tel: 08037737142.

views about the benefits of globalization especially capital market liberalization. They cited pitfalls in capital market liberalization following the International Monetary Fund's advocacy of free and unfettered markets, of market fundamentalism, among others and attributing the increased economic instability across the globe especially in markets that were liberalized to aspects of globalization that encouraged short-term capital flows and speculative hot capital. Also, over-estimation of the efficiency of financial markets especially capital markets have often led to misconceptions about the nature of expected benefits from market opening. Maduka and Onwuka (2013) argued that despite the growth record of banks and non-bank financial institutions in Nigeria, and financial liberalization policy, the Nigerian economic growth is sluggish. These views have become important considering the fact that the explosive growth witnessed during the boom period is tapering off apart from the effects of the last global financial meltdown on emerging markets which implies that benefits from market opening in the case of emerging markets are, therefore, not sustainable in the long term.

Quixima and Almeida (2014) argued that the basic arguments point to the fact that financial development may promote economic growth through improved resource allocation efficiency but economic growth also leads to increased demand for credit that should support the development of the financial sector. Njemcevic (2017) informed that most of the empirical findings have discovered a positive relationship between finance and economic growth. Regarding international trade; Manova (2008) showed that liberalization increase exports disproportionately more in sectors intensive in external finance and softer assets, suggesting that pre-liberalization trade was restricted by financial constraint. The new orthodoxy is the integration of world trade, markets and institutions but this has turned the tide against emerging economies based on the challenges facing them.

Therefore, the causality between market openness and economic growth in Nigeria, like other emerging economies no doubt, requires further investigation. In the literature, not much has been done in this regard, hence this study. Our use of several explanatory variables enhances the dis-aggregated nature of this work which has been recommended by Mohtadi and Argawal (2004). For example, majority of the studies on the relationship between financial markets and economic growth use essentially stock market measures but we expand this scope by widening such measures to include stock market development (SMD), financial liberalization (LIB), inflation (INF.), foreign direct investment (FDI), trade openness (TOP) and banking sector development (BSD).

In the case of Nigeria, added to the generic problems of emerging markets following market opening are a new set of other problems such as: shut-down of industries due to unfavourable economic climate, massive delisting of hitherto quoted companies from the stock exchange

which has affected market depth, increasing role of the Central Bank of Nigeria in the intermediation process (for example, reduced involvement in the anchor borrowers' scheme), investors' apathy, dearth of public offerings which was at its peak in the years immediately following market opening, destabilizing effects of the high ratio of non-performing loans and shrinking size of GDP per capita (in dollar terms). These are not part of the benefits expected for the economy following market opening.

Although actual date of financial liberalization of Nigerian markets had been a source of controversy in the literature, Bekaert et al. (2003) identified August, 1995 and May 1998 as the official liberalization date and first country American Depository Receipts issuance respectively. Also, Miles (2002) identified August, 1998 as official liberalization date of Nigeria. These, notwithstanding, liberalization is a gradual process and the benefits take time to manifest. Attesting to this, Henry (2000) argued that stock market liberalization is a gradual process generally involving several liberalizations subsequent to the first. The question now is: Does Nigeria require further markets opening in order to boost its economic growth? This important question has made it imperative to conduct a research to establish the relationship between market opening and economic growth in the case of Nigeria.

## LITERATURE REVIEW

The relationship between financial markets and economic growth has been a subject of discourse that has populated the literature on finance especially in post Second World War era which witnessed greater integration of world trade, markets and institutions. Pagano (1993) observed that considerable evidence exists that financial development correlates with growth and that the resulting growth theories follow new models which have offered important insights into the effect of financial development on growth and vice versa. Ujunwa and Salami (2010) on their part highlighted the fact that one of the oldest debates in economics has remained the relationship between financial development and economic growth while Abida et al. (2015) argued that efficiency of financial market matters to economic growth.

The main theme on the link between financial markets and economic growth revolve around the effects of financial markets especially on factors allowing deeper intermediation processes on economic development and that economic development itself improves the functioning of markets. The importance of the intermediation processes was highlighted by Adeniyi et al. (2012) who pointed out that the standard view, however, appears to provide support for the existence of a close association between investment and economic prosperity. Iheanacho (2016) expanded the perspective on financial intermediation by outlining the three major components of the financial intermediary system that have become

important part of the financial literature, viz: the role of financial intermediaries in the mobilization of savings, the role of financial intermediaries in enhancing economic activities in the private sector and the size of the financial intermediary system. Quixima and Almeida (2014) are of the view that the basic arguments point to the fact that financial development may promote economic growth through improved resource allocation efficiency, but economic growth also leads to increased demand for credit that should support the development of the financial sector. Azmeh et al. (2017), characteristically explained that financial systems contribute to the process of economic development while the role of stock markets in economic development has long been recognized in the literature (Pagano, 1993; Obstfeld, 1994; Greenwood and Smith, 1997; Levine and Zervos, 1998; Levine, 2000, 2001; Rousseau and Wachtel, 2000; Bekaert et al., 2001, 2003).

On their part, Madichie et al. (2014) enumerating theoretical considerations in earlier research studies on the pattern of causality between finance and growth, pointed out that causality runs from finance to growth, hence the “supply-leading hypothesis” on the one hand and on the other, that financial development can also be stimulated by economic growth. A new insight, has, however been added to the relationship between finance and growth with Arcand et al. (2012) arguing that although, there is a positive relationship between the size of the financial system and economic growth but that at high levels of financial depth, more finance is associated with less growth.

Rather than dwelling on the general issue of causalities between markets development and economic growth, Levine (2002) harped on which aspects of market (capital markets or banks) promote long-run growth. Likewise, Rioja and Valev (2004) explored the effects of finance on growth in developed and developing countries. Besides, Demirguc-Kunt and Levine (1996) reinforced this segmentation by drawing attention to the increased flow of equity investments to emerging markets. However, the literature is inundated with arguments that economic growth is impacted by several factors: financial markets (Ngongang, 2015; Hassan et al., 2016; Puryan, 2017; Njemcevic, 2017); stock market (Acquah-Sam and Salami, 2014; Njogo and Ogunlowore, 2014; Yadirichukwu and Chigbu, 2014; Niranjala, 2015; Khan and Ahmed, 2015; Khyareh and Oskou, 2015; Jareno and Negrut, 2016; Nordin and Nordin, 2016; Taiwo et al., 2016) and banks (Ngongang, 2015; Puryan, 2017).

The main argument regarding market opening in recent times revolves around allowing greater participation by international investors in domestic markets (Patro, 2005) while Pagano (1993) showed that financial intermediation has both level and growth effects; adding, however, that the resulting models have offered important insights into the effect of financial development on growth and vice versa. Odo et al. (2017) argued that in traditional growth

theory, the growth rate is a positive function of exogenous technical progress, but at the same time acknowledge that endogenous growth models on the other hand show that economic growth performance is related to financial development, technology and income distribution. Puryan (2017) giving an insight into how economic growth affects financial development, opined that when an economy grows, the market demand for financial institutions, products and services increases. Njogo and Ogunlowore (2014) opined that a well-developed capital market portrays one of the common features of a modern economy and it is reputed to perform some necessary functions, which promote economic growth in any nation. Pointing at the theoretical basis on the effects of financial development on economic growth, Hassan et al. (2016) informed that economists agreed that financial market development plays a very vital role in economic growth and development. Azmeh et al. (2017) argued and in fact chronicled studies in the literature which recognize that financial systems contribute to the process of economic growth and Ngongang (2015) subscribed that the theory of the relationship between financial development and growth has witnessed a renewal of interest during the 1990s; arguing that the authors involved in the research studies show the important role of the banking system and of the financial markets in the development of economic growth. The role of efficiency in financial markets received attention from Abida et al. (2015) when they stress that efficiency of financial market matters to economic growth. The opinion of Udude (2014) crystalized the nature of efficiency inherent in a well-developed financial system by pointing out that financial development thus involves the establishment and expansion of institutions, instruments and markets that support investment and the growth process.

Empirically, Azmeh et al. (2017) found a negative and significant effect of financial liberalization on economic growth through its effects on the level of financial development. Quixima and Almeida (2014) found that the development of the banking system did not cause economic growth in Angola but that economic growth caused the development of the banking system. On their part, Abida et al. (2015) discovered a strong positive relationship between financial development and economic growth in a panel of 3 countries in North Africa over the period 1982-2012. Ngongang (2015), showed that financial development is without effect on economic growth while Puryan (2017) found that the banking sector impacts economic development. On their part, Njogo and Ogunlowore (2014) established the fact that stock market turnover contributes positively to economic growth in Nigeria. Hassan et al. (2016) showed that there exists positive and highly statistically significant long-run relationship between market capitalization; value of stock traded and money and quasi money growth on the one hand and real gross domestic product in Nigeria on the

other. In a similar vein, Aigbovo and Izekor (2015) discovered that market capitalization, turnover ratio, total value of shares traded and all share index positively influence economic growth in the long-run. Furthermore, as it relates to Nigeria, Madichie et al. (2014) established the existence of a long run relationship between the real GDP as dependent variable and Gross Fixed Capital Formation, Financial Development, Liquidity Ratio and interest rates which were the independent variables. They, therefore, concluded that causality runs from economic growth to financial development during the period covered and that there was no bi-directional causality between them. Udude (2014) who used GDP as a dependent variable and broad money supply as a ratio of GDP and domestic credit to the private sector as a ratio of GDP (both as independent variables) finds a negative relationship between broad money supply to GDP and positive relationship between credit to the private sector and GDP. On his part, the results by Iheanacho (2016) indicated that financial development in Nigeria has insignificant negative effect on economic growth in the long-run and significant negative effect in the short-run.

## RESEARCH METHODS AND DATA

This research study focused on the impact of market opening on

$$\text{LogGDP} = \alpha_0 + \beta_0 \text{Log SMD} + \beta_1 \text{LogLIB} + \beta_2 \text{LogINGF} + \beta_3 \text{LogFDI} + \beta_4 \text{LogTOP} + \beta_5 \text{LogBSD} + \varepsilon_t \quad (2)$$

Where, GDP = Gross domestic product growth rate; SMD = stock market development; LIB = financial liberalization; INF= inflation; FDI = foreign direct investment; TOP = trade openness; BSD = banking sector development;  $\varepsilon_t$  = error term.

### Definition and measurement of variables

GDP is measured as yearly percentage change in the growth of real GDP. It is the dependent variable and in effect establishes a causal relationship between the dependent and explanatory variables. Ali and Amir (2014) explained that this explanatory variable in the partial regression represents economic growth and taken to be GDP per capita. GDP per capita is gross domestic product divided by mid-year population (Ali and Aamir, 2014). Rationalizing labour effect on growth, Njemcevic (2017) pointed out that labour is a significant factor and is expected to have important effect on growth. GDP in our context in this study is taken to be GDP per capita.

Stock market development which shows the size of the stock market was measured by the ratio of market capitalization to GDP and we believe that this measure provides a clearer picture of how the stock market impacts economic growth. This measure was similarly used by Khyareh and Oskou (2015). Also, Levine and Zervos (1998) explained that the market capitalization ratio equals the value of listed shares divided by GDP and was used by them as a measure of market size.

Financial liberalization index was used following the study by Auzairy et al. (2011). They defined stock market liberalization as the

the economic growth in Nigeria for the period: 1986 – 2016. Secondary data were sourced from Central Bank of Nigeria (CBN) Statistical Bulletin (various issues), National Bureau of Statistics (NBS), 2017, Nigerian Stock Exchange (NSE) Factbook (various years) and World (Bank) Development Indicator Database, 2017.

The study adopted a time series method of regression analysis and used Stationarity tests involving Augmented Dickey-Fuller, (1979) (ADF) tests, Johansen co-integration test and VECM to analyze the impact of market opening on economic growth in Nigeria. It also used the Granger causality test to establish the direction of the causality of the variables used, viz: Gross Domestic Product (GDP), Stock Market Development, Financial Liberalization, Inflation, Foreign Direct Investment, Trade Openness and Banking Sector Development. The Co-integration test was used to test the Null Hypothesis that market opening does not have significant effect on economic growth in Nigeria. Furthermore, the Granger, (1969) causality test was used to test the Null Hypothesis that market opening does not Granger cause economic performance of Nigeria.

### Model specification

The following specifies the relationship between the Dependent variable (GDP) and the Explanatory variables – Stock Market Development, Financial Liberalization, Inflation, Foreign Direct Investment, Trade Openness and Banking Sector Development.

$$\text{GDP} = f(\text{SMD, LIB, INF, FDI, TOP and BSD}) \quad (1)$$

Transformed into an econometric model, thus:

event when there is a percentage change in foreign ownership of local companies hence, we adopted their approach.

On our part, inflation was used to measure the annual percentage change in consumer price index as a measure of price-cum-economic stability. Inflation has equally been used in the literature (Abida et al., 2015; Azmeh et al., 2017; Njemcevic, 2017). Abida et al. (2015) in addition, pointed out that a negative coefficient is expected as high inflation has been found to negatively affect growth while Njemcevic expressly informed that inflation is the variable that could have a positive impact if it has a low rate and negative if the rate is high, causing economic instability.

With regards to trade openness, the method used by Khyareh and Oskou (2015) was adopted who used Total Trade Ratio to GDP which is the value of imports plus exports as a fraction of GDP per capita to measure the degree of openness to international trade.

In the case of foreign direct investment (FDI), Naceur et al. (2008) argue that it is regarded in the literature as an effective channel to transfer technology and foster growth in developing countries, hence, we emulated their adoption of FDI as a measure of economic growth.

With regards to Banking Sector Development as an explanatory variable of GDP, it was measure as the ratio of credit to the private sector to GDP. This measure was used by Ngongang (2015) and Naceur et al. (2008) in similar fashion. Abida et al. (2015) argued that this indicator is the ratio of domestic credit to GDP but point out that a high ratio of domestic credit to GDP indicates not only a high level of domestic investment, but also higher development of the financial system.

**Table 1.** Descriptive result.

Variable	RGDP	SMD	LIB	INF	FDI	TOP	BSD
Obn.	31	31	31	31	31	31	31
Mean	35709.65	11.29	1330.38	20.28	3.27	33.61	11.61
Max	69023.93	39.95	10858.10	72.84	10.83	58.92	23.08
Min	17007.77	3.05	53.40	5.38	0.65	7.36	6.22
Std. Dev.	17270.59	8.63	2161.96	18.83	2.28	11.09	5.95
Skewness	0.729525	1.32	3.12	1.52	1.69	-0.18	0.92
Kurtosis	2.067211	4.88	13.48	3.89	5.92	3.04	2.07
Jarque-Bera(prob.)	3.88( 0.14)	13.58( 0.00)	192.21( 0.00)	13.01( 0.00)	25.85( 0.00)	0.16( 0.92)	5.48( 0.06)

Source: Authors' Computation 2019; underlying data were obtained from Central Bank of Nigeria (CBN) Statistical Bulletin, 2016 and World Development Indicator (WDI), 2017. RGDP, Real gross domestic product; SMD, stock market development; LIB, liberalization; INF, inflation; FDI, foreign directive investment; TOP, trade openness; BSD, banking sector development.

**Table 2.** Lag Order Selection Result.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-197.9860	NA	0.003254	14.13696	14.46700	14.24033
1	-69.94005	185.4458	1.55e-05	8.685521	11.32582*	9.512428
2	5.297992	72.64363*	4.96e-06*	6.876001*	11.82655	8.426452*

Source: Authors' Computation 2019; underlying data were obtained from Central Bank of Nigeria (CBN) Statistical Bulletin, 2016 and World Development Indicator (WDI), 2017. \*Indicates lag order selected by the criterion; LR, sequential modified LR test statistic (each test at 5% level); FPE, Final prediction error; AIC, Akaike information criterion; SC, Schwarz, information criterion; HQ, Hannan-Quinn information criterion.

## RESULTS

### Descriptive analysis

Table 1 presents the descriptive statistics of variables considered in the study. Generally, the standard deviation shows diverse variability in the series. From the Table 1, real gross domestic product (RGDP) has an average value of N35,709.65b Nigerian Naira. Stock market development (SMD), proxied by ratio of market capitalization to GDP, averaged 11.29%. Financial Liberalization (LIB), proxied by percentage change in the foreign ownership of local companies quoted on the Nigerian stock exchange, has an average value of 1330.38%.

Furthermore, Inflation (INF) has a mean of 20.28%. Foreign directive investment (FDI) has an average value of 3.27%. Trade openness (TOP) has an average value of 33.61%. Banking sector development (BSD), proxied by ratio of credit to the private sector to GDP, has a mean value of 11.61%. Skewness is a measure of asymmetry of the distribution of the series around its mean. A variable that is normally distributed will have its skewness to be zero (0). The kurtosis of the normal distribution is 3. However, Jarque-Bera being a superior test statistic for testing whether the series is normally distributed or not, have small probability values (less than 0.05), hence, we rejected the null hypothesis of a normal distribution. Thus

the study concludes that virtually all the series are not normally distributed.

### Stationarity tests

These comprise unit root tests (Augmented Dickey-Fuller and Phillips-Peron, (1988) unit root test). From the results, the p-value of the series suggests the acceptance of the null hypothesis of no stationarity in each series at all levels with the exception of LOG(LIB), LOG(FDI) and LOG(TOP) under PP criteria. However, based on the ADF result, the study considers the first difference transformation of each series. The results of first difference fail to accept the null hypothesis of no stationarity within the 1% and 10% conventional levels of significance, hence, we accepted the alternative hypothesis and conclude that each of the series are stationary at first difference. This is to say that all the series are integrated of order one (I (1)) and having regard to the order of integration, the study proceeds to integration test.

### Lag selection structure

Table 2 presents lag order selection result on the variables considered in this study. The lag length selection criteria begin with the specification of maximum

**Table 3.** VECM System of Equation.

	<b>Coefficient</b>	<b>Std. Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
C(1): CointEq1	-0.005793	0.002603	-2.225295	0.0372
C(2): D(LOG(RGDP(-1)))	0.720627	0.112784	6.389455	0.0000
C(3): D(LOG(SMD(-1)))	0.055557	0.026175	2.122546	0.0458
C(4): D(LOG(LIB(-1)))	-0.003690	0.004738	-0.778817	0.4448
C(5): D(INF(-1))	0.000409	0.000406	1.006589	0.3256
C(6): D(LOG(FDI(-1)))	0.023966	0.012277	1.952160	0.0644
C(7): D(LOG(TOP(-1)))	0.043797	0.021005	2.085028	0.0495
C(8): D(LOG(BSD(-1)))	-0.018483	0.041332	-0.447181	0.6593
R-squared	0.430744	Mean dependent var		0.046666
Adjusted R-squared	0.240993	S.D. dependent var		0.038142
S.E. of regression	0.033230	Akaike info criterion		-3.741772
Sum squared residual	0.023189	Schwarz criterion		-3.364587
Log likelihood	62.25569	Hannan-Quinn criter.		-3.623642
Durbin-Watson stat	2.388635			

Source: Authors' Computation 2019; underlying data are obtained from Central Bank of Nigeria (CBN) Statistical Bulletin, 2016 and World Development Indicator (WDI), 2017. RGDP, Real gross domestic product; SMD, stock market development; LIB, liberalization; INF, inflation; FDI, foreign directive investment; TOP, trade openness; BSD, banking sector development.

lag of 2. An asterisk indicates the selected lag from each column of the criterion statistic. Based on the Schwarz information criterion (SC), the study considers the lag length of 1 as the optimal lag length.

### Co-integration test

Table 3 presents co-integration test result on the selected series. The test statistic indicates that the hypothesis of no co-integration ( $H_0$ ) among the variables can be rejected. It shows that there is at most, three co-integrating relation in our model. Knowing fully well that one co-integrating relation is enough to prove that long-run relationship exists among the variable in the model. This suggests that the study can proceed to estimating VECM.

### Vector error correction estimates

Table 3 presents the vector error correction model (VECM) result of target model using system of equation. There are several important observations that can be made from the result, however, the most prominent of all are the error correction terms (CointEq1), the first difference and lag operators which indicate that the results were obtained from the first step VAR in first deference, R-squared and F-statistic, at the lower part of the Table 3. From the result, the  $R^2$  value of 0.431 shows that the explanatory variables explain about 43.1% of the variation in economic growth.

The F-Statistics value of 2.27 indicates that the model is significant. The value (D.W Statistics = 2.39) shows that the model is free from autocorrelation problem. The negative and significance of the coefficient of error correction term (-0.0058) provides the evidence that the current value of RGDP respond to disequilibrium from the values of RGDP, SMD, LIB, INF, FDI, TOP and BSD one year ago. Interpreting the short run effect, according to Hoxha (2010), the estimates of parameters associated with the lagged differences of the explanatory variables can be interpreted in the usual way. In general, the result shows that, past values of real gross domestic product ( $RGDP_{t-1}$ ), stock market development ( $SMD_{t-1}$ ), foreign directive investment ( $FDI_{t-1}$ ) and trade openness ( $TOP_{t-1}$ ) are positively related to current value of GDP within the 1 and 10% conventional alpha levels. These imply that the past values of RGDP, SMD, FDI and TOP improve economic growth during the period of this study. In contrast, the result of the coefficients of inflation ( $INF_{t-1}$ ), financial liberalization ( $LIB_{t-1}$ ) and banking sector development ( $BSD_{t-1}$ ) are insignificant indicating that the indicators are not major determinants of economic growth.

### Diagnostics check

#### *Inverse roots of the AR*

The test on stability condition for the model indicates that no root lies outside the unit circle. The graphical output of the stability condition is displayed in Figure 1. It clearly shows that all the inverse roots of the AR characteristic

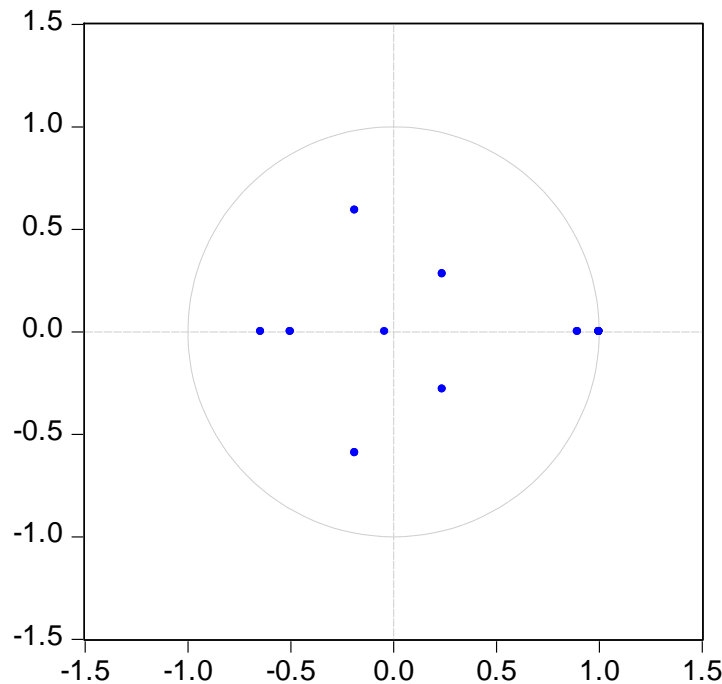


Figure 1. Inverse Roots of AR Characteristics Polynomial.

polynomials lie within and on the unit circle thus conclude that the VECM models satisfy the stability condition.

### Granger causality test

To further investigate the short run causal relationship among the explanatory variable and employment in the VECM, the study used pairwise granger causality since all the variables are integrated of order 1;  $I(1)$ . As can be seen from the results, there is no bi-directional relationship. However, the result clearly shows that there are short run causalities that run from SMD to RGDP, INF, FDI and BSD, from RGDP to LIB, FDI and BSD. Also, it shows that there are causalities that flow to LIB from TOP, FDI from INF, TOP from INF, FDI from BSD and TOP from BSD. All these relationships are established within the 1 and 10% levels of significance.

### DISCUSSION

From the analysis, it can be seen that during the period of study (1986 – 2016), there was a change in real GDP growth rate by 306% (minimum value N17,007.77 Nigerian Naira and maximum N69,023.93 Nigerian Naira). Similarly, the size of the market as measured by the ratio of market capitalization to GDP increased by more than 12 times (minimum value 3.05 and maximum value 39.95) its value prior to liberalization. This inferred

that market opening has led to increase in the depth of the Nigerian stock market. The same growth trajectory can be observed in the case of change in the percentage ownership of equities listed on the local bourse (Nigerian Stock Exchange) by foreign investors as measured by LIB. LIB changed by as much as 202334% (minimum ratio 53.40 and maximum ratio 10858.10) during the period of study which simply means that foreign portfolio investments increased significantly which can point to the fact that market opening has provided ample opportunity for international risk diversification. However, the rate of inflation changed by as much as 1253%; which can be attributed largely to the effects of foreign inflow of funds sequel to the market opening. In the case of FDI, which measured its effectiveness in the transfer of technology and measure of economic growth, *ceteris paribus*, the growth rate increased further by 1566% during the period of study which suggest that market opening spurred economic growth in Nigeria during the period of study. As regards trade which was openness which measured the value of imports and exports as a fraction of GDP, the results showed an increase of well over 700% (minimum value 7.36 and maximum value 58.92) during the period of study which suggested that the Nigerian market became more integrated with the global markets. This integration of the local market with the global market justified the need for liberalization which was needed to speed up the process of economic development as it has been stated in the literature (Abida et al., 2015 argued that countries embark on reforms in order to speed up

their growth rates). Banking sector development measured by the ratio of credit to the private sector to GDP changed by as much as 271% which indicated not only a high level of increase in domestic investment but equally established a higher level of development of the financial system. With respect to the result from the descriptive analysis, it has to be pointed out that increases witnessed in the performance indicators did not point to the fact that the minimum levels indicated were as at the date of announcement of liberalization and the maximum levels indicated were as at the terminal date of the study but the statistics established the positive growth trajectories which occurred during the period of study since liberalization events and its effects occur sequentially.

In terms of stationarity of the data set, the series are integrated of order one (I(1)) and the co-integrating test result showed that there was a long-run relationship among the variables used. Furthermore, the VECM established that past values of  $SMD_{t-1}$ ,  $FDI_{t-1}$  and  $TOP_{t-1}$  positively improved economic growth as measured by  $RGDP_{t-1}$  (real economic growth) in Nigeria. However, results from the VECM showed that  $INF_{t-1}$ ,  $LIB_{t-1}$  and  $BSD_{t-1}$  were not major determinants of economic growth in Nigeria.

### Conclusion and recommendation

From the result of the study conducted within the period 1986 to 2016, using a robust set of econometric approach involving unit root tests, co-integration test, vector error correction model and granger causality; the unit root test results show that all the series are integrated of order 1, the Johansen co-integration test for the VEC model indicates that the series are co-integrated and that long-run equilibrium exists among the selected series.

The negative and significant value of the error correction term in the VECM estimates confirms the stability of the system and provides evidence that the current value of economic growth responds to disequilibrium from the past values of real gross domestic product, stock market development, foreign directive investment, trade openness, inflation and banking sector development. The result also shows that past values of real gross domestic product ( $RGDP_{t-1}$ ), stock market development ( $SMD_{t-1}$ ), foreign directive investment ( $FDI_{t-1}$ ) and trade openness ( $TOP_{t-1}$ ) promotes economic growth in Nigeria in the short run.

Furthermore, the granger causality result confirms the existence of short run causal relationships that run from stock market development (SMD) to economic growth. Also, evidence from the granger causality result shows that economic growth stimulate financial liberalization (LIB), foreign direct investment (FDI) and banking sector development (BSD) in Nigeria, hence, financial liberalization (LIB), foreign direct investment (FDI) and

banking sector development (BSD) were found not invariant to economic growth.

Therefore, it can be concluded that there are bi-directional causalities both in the short-term and long-term between the dependent and explanatory variables. Based on the findings, it is recommended, among other things, that policy makers in Nigeria should pay more attention to factors that can boost stock market development (SMD), foreign direct investment (FDI), trade openness (TOP), inflation (INF) and banking sector development (BSD) in order for these to impact economic growth more positively. This will in turn spur more positive development of the financial markets.

### CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

### REFERENCES

- Abida Z, Sghaier IM, Zghidi N (2015). Financial Development and Economic Growth: Evidence from North African Countries. *Economic Alternatives* 2:17-33.
- Acquah-Sam E, Salami K (2014). Effect of Capital Market Development on Economic Growth in Ghana. *European Scientific Journal* 10(7):511-534.
- Adeniyi O, Omisakin O, Egwaikhide FO, Oyinlola A (2012). Foreign Direct Investment, Economic Growth and Financial Sector Development in Small Open Developing Economies, *Economic Analysis and Policy* 42:1.
- Aigbovo O, Izeke AO (2015). Stock Market Development and Economic Growth in Nigeria: An Empirical Assessment. *International Journal of Business and Social Science* 6(9):1.
- Ali MA, Amir N (2014). Stock Market Development and Economic Growth: Evidence from India, Pakistan, China, Malaysia and Singapore. *International Journal of Economics Finance and Management Sciences* 2:220-226.
- Arcand J, Berkes E, Panizza U (2012). Too Much Finance. *International Monetary Fund Working Paper* WP/12/161.
- Auzairy NA, Ahmad R, HO CSF (2011). The Impact of Stock Market Liberalization and Macroeconomic Variables on Stock Market Performances. *International Conference on Financial Management and Economics* 11:358-362.
- Azmeh C, Al Samman, Mouselli S (2017). The Impact of Financial Liberalization on Economic Growth: The Indirect Link. *International Business Management* 11(6):1289-1297.
- Bakaert G, Harvey CR, Lundblad C (2001). Emerging Equity Markets and Economic Development. *Journal of Development Economics* September pp. 1-31.
- Bekaert G, Harvey CR, Lundblad CT (2003). Equity Market Liberalization in Emerging Markets. *Journal of Financial Research* 26(3):275-299.
- Demirguc-Kunt, A. and Levine, R. (1996), "Stock Markets, Corporate Finance and Economic Growth: An Overview", *World Bank Economic Review* 10(2):223-239.
- Dickey DA, Fuller WA (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association* 74(366):427-431.
- Granger CWJ (1969). Investigating Causal Relations by Econometric Models and Cross Spectral Methods. *Econometrica* 37:24-35.
- Greenwood J, Smith BD (1997). Financial Markets in Development and the Development of Financial Markets. *Journal of Economic Dynamics and Control* 21:145-181.
- Hassan A, Babafemi OD, Jakada AH (2016). Financial Market Development and Economic Growth in Nigeria: Evidence from VECM



- Approach. *International Journal of Applied Economic Studies* 4(3):1-13.
- Henry PB (2000). Do Stock Market Liberalizations Cause Investment Booms? *Journal of Financial Economics* 58(1-2):301-334.
- Hoxha A (2010). Causality between Prices and Wages: VECM Analysis for EU-12. *Theoretical and Applied Economics* 5(546):27-48.
- Iheanacho E (2016). The Impact of Financial Development on Economic Growth in Nigeria: An ARDL Analysis. *Economies* 4(4):26.
- Jareno F, Negrut L (2016). US Stock Market and Macroeconomic Factors. *The Journal of Applied Business Research* 32(1):325-340.
- Johansen S (1995). *Likelihood-based Inference in Cointegrated Vector Autoregressive Models* Oxford. Oxford University Press on Demand.
- Khan K, Ahmed I (2015). Impact of Stock Prices on Macroeconomic Variables: Evidence from Pakistan. *KASBIT Business Journal (KBJ)* 8(1):42-59.
- Khyareh MM, Oskou V (2015). The Effect of Stock Market on Economic Growth: The Case of Iran. *International Journal of Academic Research in Economics and Management Sciences* 4(4):52-62.
- Kim EH, Singal V (2000). The Fear of Globalizing Capital Markets. *Emerging Markets Review* 1:183-198.
- Levine R, Zervos S (1998). Capital Control Liberalization and Stock Market Development. *World Development* 26(7):1169-1183.
- Levine R (2000). International Financial Liberalization. *Review of International Economics* pp. 1-28.
- Levine R (2001). International Financial Liberalization and Economic Growth. *Review of International Economics* 9 (4):688-702.
- Levine R (2002). Bank-Based or Market-Based Financial Systems: Which one is Better? *Journal of Financial Intermediation* 11:398-428.
- Madichie C, Maduka A, Oguanobi C, Ekesiobi C (2014). Financial Development and Economic Growth in Nigeria: A Reconsideration of Empirical Evidence. *Journal of Economics and Sustainable Development* 5:28.
- Maduka AC, Onwuka KO (2013). Financial Market Structure and Economic Growth: Evidence from Nigeria Data. *Asian Economic & Financial Review* 3(1):75-98.
- Manova K (2008). Credit Constraints, Equity Market Liberalizations and International Trade. *Journal of International Economics* 76:33-47.
- Miles W (2002). Financial Deregulation and Volatility in Emerging Equity Markets. *Journal of Economic Development* 27(2):113-126.
- Mohtadi H, Agarwal S (2004). Stock Market Development and Economic Growth: Evidence from Developing Countries. Retrieved from <http://www.edu.mo.htadi/PAN-4-01.pdf>.1-18.
- Naceur S, Ghazouani S, Omran M (2008). Does Stock Market Liberalization Spur Financial and Economic Development in the MENA region? *Journal of Comparative Economics* 36(4):673-693.
- National Bureau of Statistics (2017). FISCAL STATISTICS JANUARY - JULY 2017. <https://www.nigerianstat.gov.ng/>
- Ngongang E (2015). Financial Development and Economic Growth in Sub-Saharan Africa: A Dynamic Panel Data Analysis. *European Journal of Sustainable Development* 4(2):369-378.
- Niranjala SAU (2015). Stock Market Development and Economic Growth in Sri Lanka. *Global Journal of Management and Business Research: Economics and Commerce* 15(8):1-7.
- Njemcevic F (2017). Capital Market and Economic Growth in Transition Countries: Evidence from South East Europe. *Journal of International Business Research and Marketing* 2(6):15-22.
- Njogo BO, Ogunlowore AJ (2014). Impact of Nigerian Financial Markets on the Economic Growth. *International Journal of Financial Markets* 1(3):77-82.
- Nordin S, Nordin N (2016). The Impact of Capital Market on Economic Growth: A Malaysian Outlook. *International Journal of Economics and Financial Issues* 6(S7):259-265.
- Obstfeld M (1994). Risk-Taking, Global Diversification and Growth. *The American Economic Review* 84(5):1310-1329.
- Odo SI, Anoke CI, Onyeisi OS, Chukwu BC (2017). Capital Market Indicators and Economic Growth in Nigeria; An Autoregressive Distributed Lag (ARDL) Model. *Asian Journal of Economics, Business and Accounting* 2(3):1-16.
- Ortiz E, Cabello A, Jesus RD (2007). The role of Mexico's Stock Exchange in Economic Growth. *Journal of Economic Asymmetries* 4(2):1-135.
- Pagano M (1993). Financial Market and Growth: An Overview. *European economic review* 37(2-3):613-622.
- Patro D (2005). Stock Market Liberalization and Emerging Market Country Fund Premiums. *The Journal of Business* 78(1):135-168.
- Phillips PCB, Perron P (1988). Testing for a Unit Root in Time Series Regression. *Biometrika* 75(2):335-346.
- Puryan V (2017). The Causal Relationship Between Economic Growth, Banking Sector Development and Stock Market Development in Selected Middle-East and North African Countries. *International Journal of Economics and Financial Issues* 7(3):575-580.
- Quixima Y, Almeida A (2014) Financial Development and Economic Growth in a Natural Resource Based Economy: Evidence from Angola. FEP Working Paper pp. 1-16.
- Rioja F, Valev N (2004). Finance and the Sources of Growth at Various Stages of Economic Development. *Economic Inquiry* 4(1):127-140.
- Rousseau PL, Wachtel P (2000). Equity Markets and Growth: Cross-Country Evidence on Timing and Outcomes, 1980-1995. *Journal of Banking and Finance* 24:1933-1957.
- Stigliz JE (2004). Capital Market Liberalization, Globalization and the IMF. *Oxford Review of Economic Policy* 20(1):57-71.
- Taiwo JN, Adedayo A, Evawere A (2016). Capital Market and Economic Growth in Nigeria. *Accounts and Financial Management Journal* 1(8):497-525.
- Udude C (2014). Financial Development and Economic Growth in Nigeria: An Empirical Investigation (1980-2012). *International Journal of Social Sciences and Humanitarian Reviews* 4(4):198-204.
- Ujunwa A, Salami OP (2010). Stock Market Development and Economic Growth: Evidence from Nigeria. *European Journal of Economics, Finance and Administrative Sciences* 25:44-53.
- Yadirichukwu E, Chigbu EE (2014). The impact of capital market on economic growth: the Nigerian perspective. *International journal of development and sustainability* 3(4):838-864.

*Full Length Research*

# Temperature-based options for Vietnam: An option pricing and policy insight

TRAN Do Thinh Hoang and OTAKE Toshitsugu\*

Graduate School of Management, Ritsumeikan Asia Pacific University, 1-1 Jumonjibaru, Beppu, Oita 874-8577, Japan.

Received 25 January, 2020; Accepted 24 February, 2020

The purpose of this paper is to test a temperature-based pricing model of Alaton (2002) in main rice-growing cities of Vietnam. The results of the test are then used for loss hedging analysis and policy implications for Vietnamese farmers, investors and related parties. Data are collected from General Statistics Office (GSO) of Vietnam, 2017 and Vietnam Meteorological and Hydrological Administration, with a reference to [acuweather.com](http://www.acuweather.com), on which the Alaton model is run. We suggest that temperature-based options are great tools for Vietnamese farmers to hedge unfavorable weather risks, and for investors to earn speculative profits. The great geographic diversity among Vietnam cities shows that there is a great potential to expand option contracts nationwide. By far, we acknowledge that findings are constrained by the limited temperature data in Vietnam, and the lack of comparable market prices. Furthermore, the pricing model itself assumes normal distribution, which might not fully capture the evolution of daily and seasonal temperature. Weather derivatives, especially the covered temperature-based options, are potential insurance for farmers and agricultural manufacturers besides existing price subsidiaries. From a policy perspective, the establishment of an active trading market can support the expanded use of weather derivatives within and outside the agriculture sector.

**Key words:** derivatives, mean-reversion process, agricultural finance.

## INTRODUCTION

Vietnamese farmers have been struggling to come up with better solutions to mitigate the effects of unfavorable weather patterns with several agricultural cities and provinces adopting new planting technology and receiving many government's price subsidiaries and credit extension. The authorities in many agriculture-based cities in Vietnam have also promoted renewals and new construction of more effective irrigation system, thereby helping to increase agricultural production's resistance to water shortage or temperature heights. However, agriculture practice in the country is unique, that is,

farmers grow their crops in small family paddy fields, unlike American or European farmers who have huge farms.

Given this characteristic, we suggest that besides existing province-wide assistance, there is a need for alternative insurance contracts gearing towards individual farmers. Such contracts will be able to allow farmers and manufacturers to actively hedge weather risks and have a trading market in order to avoid overpricing or price manipulation. On the other hand, on pace with a rapid GDP growth (6.79% in 2017), the financial market in

\*Corresponding author. E-mail: [totake@apu.ac.jp](mailto:totake@apu.ac.jp).

Vietnam is developing at a promising rate. Since 2016, two main stock exchanges of Vietnam - Ho Chi Minh stock exchange and Ha Noi stock exchange - have introduced stock-underlying futures and warrants into the market. We see great potentials for a derivative market in Vietnam and we believe they will be used extensively in coming years to an extent that the underlying assets will cover not only stocks but also commodities or weather elements.

Therefore, we propose weather derivatives are appropriate devices to insure farmers against unfavorable and unpredictable climate, and they provide investors with strong earnings possibilities. The underlying assets of weather derivatives can be temperature, precipitation, or humidity, which are mostly uncorrelated with the financial market and provide great diversification advantages. The most common underlying asset is temperature, which gives rise to a branch of weather derivative: temperature-based derivatives.

## LITERATURE REVIEW

Although the country is moving towards modernization with more focus on the service sector, Vietnam still has agriculture sector to account for 15.34% of GDP in 2017 (GSO, 2018). Vietnam is home to diverse agriculture, among which the water rice is the most important crop for national food security and export. Fruits, vegetables and other crops are planted within the rice harvest seasons. Under the effect of global warming, and constructions of dams in the Mekong River, the normal rice harvest seasons are seeing increasing volatile in temperatures and precipitation which results in heavier draughts or floods. These uncontrollable weather patterns cost the agriculture sector billions of dollars in losses. Therefore, it is a growing concern for farmers and agriculture co-ops to manage weather-related risks.

Besides the current 10% price subsidiaries, weather derivatives can also act as insurance for farmers, as argued by Heimfarth and Musshoff (2011). The market for weather derivatives in the US grew by 20% year-over-year in 2011 to \$11.8 billion, which signifies the potential of their usage. However, in developing markets like China or Vietnam, there are not any active trading markets for weather derivatives. Liu (2006) explained the market for weather derivatives in China and acknowledged the lack of real trading data as the greatest barrier to develop a sound market.

To address this issue, we recognize the pricing model for temperature-based derivatives of Alaton (2002) is extremely useful. We used the Ornstien-Unlenbeck process (OU process) to model temperature pattern, the Alaton model values option contracts whose underlying assets are temperatures. Kermiche and Vuillermet (2016) applied the Alaton (2002) model and concluded that "the temperature derivatives contracts created in this study proved to be efficient tools for hedging climatic risk and

decreasing volatility in production revenues for farmers". Lu and Ender (2014) tested Alaton model (2002) and Benth et al. (2007) model on several cities in China. In addition, Schiller et al. (2012) proposed an extension from the Alaton model by measuring intra-day seasonality through the testing of Alaton model and other models. Taking into account of the emerging nature of the Vietnam financial market, and the imminent widespread ease-to-use, we applied the Alaton model to price temperature-based options for five main rice-growing cities in Vietnam. We try to extend the scope of the studies of Lu and Ender (2014) by not only testing the model, but also giving practical implications which might be applicable for Vietnam and other nearby South East Asian markets.

## METHODOLOGY

The main data in this paper are temperature. Temperature data points are collected from GSO and Vietnam Meteorological and Hydrological Administration. Collected temperatures are normalized and grouped first into panel data with marked time  $t_1$  to respective time  $t_n$ , where  $n$  is the number of days in a period. Then, by using extension packages from Excel and Matlab, panel data are bonded into matrix vectors for later use in OU process. In addition, to facilitate result discussion and implications, statistical data regarding Vietnam equity market, Vietnam labor statistics, GDP, and rice export value are retrieved primarily from GSO and State Securities Commission of Vietnam (SSC), 2018.

Processed data are used as input to find the necessary variables in the Alaton (2002) model, among which the most important element is the temperature volatility estimator. Such an estimator is important to describe the mean-reversing revolution of temperature. The model is implemented for five cities in Vietnam, and a model in each city produces its respective option price. Particularly in this paper, only call options are considered because call options offer long positions limited downside, which is the insurance mechanism for farmers.

## TEMPERATURE MODELING

Compared with the CAR model by Benth et al. (2007), Alaton (2002) used a more specific range of time to try to figure out the patterns of temperature, although Alaton and Benth have both improved the index modeling method. The Alaton model assumes a constant monthly volatility estimator under a continuous time OU process, which by itself describes the day-to-day difference in temperature accordingly to the regional/local temperature. The cooling-degree-day (CDD) and the heating degree-day (HDD) are the most common underlying assets of temperature-based derivative contracts under the following formulas:

$$\text{HDD}_i = \max \{18 - T_i, 0\} \quad (1)$$

$$\text{CDD}_i = \max \{T_i - 18, 0\} \quad (2)$$

**Table 1.** Estimated values for monthly temperature volatilities for cities in Vietnam.

City	January	February	March	April	May	June	July	August	September	October	November	December
Thái Bình	2.54	5.09	5.03	3.53	2.22	1.74	1.00	1.82	1.46	2.32	3.17	1.32
An Giang	1.51	1.79	1.08	2.44	1.74	1.47	2.53	1.08	0.94	2.20	1.39	2.35
Nam Định	3.32	5.27	4.84	3.22	2.01	1.97	1.00	1.75	1.43	2.32	3.22	1.29
Hải Dương	2.01	3.05	4.94	2.67	2.21	2.31	1.00	1.69	1.96	2.33	2.21	1.32
Ninh Bình	2.04	3.04	4.96	2.43	2.26	2.58	1.14	1.72	1.96	2.31	1.95	1.33

Source: Authors' calculation.

The number of HDDs or CDDs is the deviation of daily average temperatures (DATs) from certain reference levels, which is 18 degrees Celsius as a US industry standard.

In order to build the model that predicts temperature evolution, we use historical daily temperature in 2017 for 5 cities in the northern region of Vietnam, where agricultural harvest seasons are similar to one another. In order to model temperature, the Alaton model (2002) fits the DATs with a part that describes the annual seasonality of the model, and a random, driving-noise and mean-reversion process. The first part is able to structure annual temperature into a trigonometric function:

$$T_t^m = A + B \cdot t + C \cdot \sin(\omega t + \varphi) \tag{3}$$

where  $t$  stands for measured daily temperature and  $\omega = 2\pi/365$ .  $A$ ,  $B$ ,  $C$  and  $\varphi$  denote the mean temperature, the parameter that represents the global warming, the scale parameter and the translation parameter of the trigonometric function, respectively (Lu, 2007).

Then, we know that temperature cannot rise day by day for a continuous period of time. Therefore, the stochastic process describing the temperature evolution should be a mean-reversion one. Alaton (2002) put forth the following model for the temperature under an OU process, starting at  $T_s = x$ :

$$dT_t = \left\{ \frac{dT_t^m}{dt} + a(T_t^m - T_t) \right\} dt + \sigma_t dW_t, t > s \tag{4}$$

The second part is a solution to (4) is:

$$T_t = (x - \frac{T_s^m}{s}) e^{-a(t-s)} + T_t^m + \int_s^t e^{-a(t-\tau)} \sigma_\tau dW_\tau \tag{5}$$

where  $T_t^m$  is given by Equation 3,  $W_t$  is a Brownian motion and  $a$  is the mean-reverting parameter of the OU process. Alaton (2002) states that the volatility parameter  $\sigma$  is measured constantly, which describes the relative differences in daily temperature within a month (typically 30 days). To measure  $\sigma$ , first we find the quadratic

variation of  $T_t$  in term of  $\sigma_\mu$ , during a given month  $\mu$ . The estimator of  $\sigma_\mu$  is:

$$\hat{\sigma}_\mu^2 = \frac{1}{N_\mu} \sum_{j=0}^{N_\mu-1} (T_{j+1} - T_j)^2 \tag{6}$$

Next, during the a given month  $\mu$ , the second estimator  $\sigma_p$  is found by discretizing Equation 4 by:

$$\tilde{T}_j = a \cdot T_{j-1}^m + (1-a) \cdot T_{j-1} + \sigma_\mu \cdot \epsilon_{j-1} \tag{7}$$

where  $\epsilon_{j-1} \sim N(0,1)$  are independent standard normally distributed random variables.

The estimator of  $\sigma_p$  is (Alaton, 2002):

$$\hat{\sigma}_p^2 = \frac{1}{N_\mu-2} \sum_{j=1}^{N_\mu} (\tilde{T}_j - \hat{a}T_{j-1}^m - (1-\hat{a})T_{j-1})^2 \tag{8}$$

The  $\sigma$  value is the arithmetic average of  $\sigma_\mu$  and  $\sigma_p$ . We also need to find  $a$ , which is estimated by  $\hat{a}_n$ :

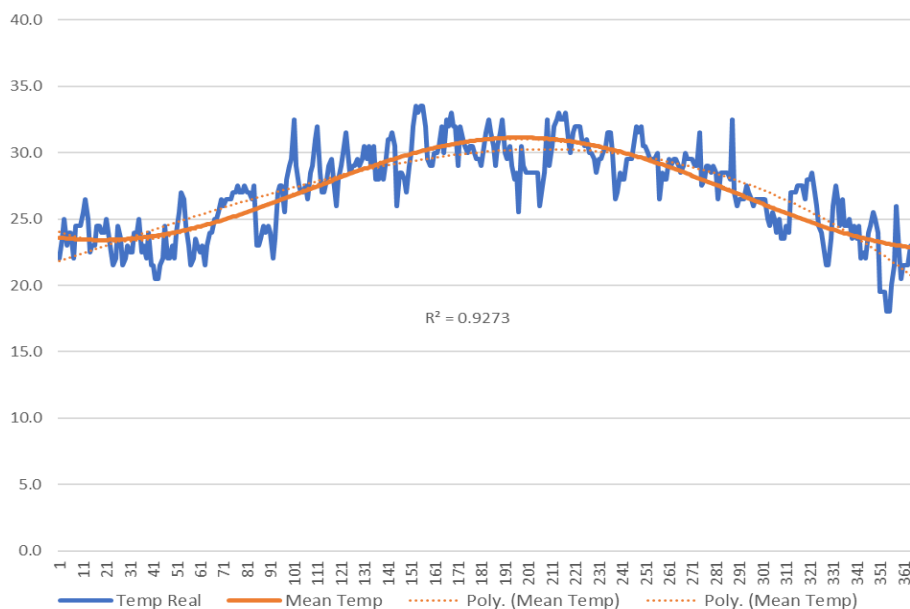
$$\hat{a}_n = -\log \left( \frac{\sum_{i=1}^n Y_{i-1} (T_i - T_i^m)}{\sum_{i=1}^n Y_{i-1} (T_{i-1} - T_{i-1}^m)} \right) \tag{9}$$

where

$$Y_{i-1} = \frac{T_{i-1}^m - T_{i-1}}{\sigma_{i-1}^2} \quad i=1, 2, \dots, n \tag{10}$$

The results of monthly temperature volatility parameter are shown in Table 1. Figure 1 shows the Alaton (2002) model's curve of An Giang in 2017 (365-day year).

Figure 1 depicts real daily temperature evolution versus daily temperature evolution modeled by Alaton model (2002).  $R^2$  of the daily temperature evolution line modeled by Alaton model is equal to 0.9273, thus Alaton model (2002) is able to simulate daily temperature evolution quite close to reality. From this we can see that the Alaton model gives reliable prediction for temperature evolution



**Figure 1.** An Giang daily mean temperature by Alaton model (2002) versus real temperature  
Source: Authors' calculation.

in Vietnam.

### TEMPERATURE-BASED DERIVATIVES PRICING

Since temperatures and its indexes like HDDs and CDDs are non-tradable underlying assets, valuation directly from a risk-neutral method and market prices like the Black-Scholes model is difficult. Therefore, a market price of risk is necessary to relate the payoff from the underlying asset with the real payoff in the existing capital and derivatives market. Canbrera (2009) uses Berlin traded futures to calculate the market price of risk. Although finding a market price of risk is mostly difficult, Goncu (2011) suggested that the effect of market price of risk is insignificant for weather derivatives.

Therefore, in this paper, we set the market price of risk at 6.8% accordingly to Vietnam's 2017 equity risk premium. We also assume that once the market for agricultural derivatives is established, the risk aversion of investors in such market will be as same as the traditional stock market. Furthermore, taking into account that Vietnam is still a frontier market, financial knowledge of market players is limited, and the model is simple to implement, we will also evaluate only call options – since longing a call would likely equal to shorting a put in a bull market. In addition, we assume that farmers/manufacturers will always be long positions to hedge their risks.

Furthermore, we take the annual temperature range from 2000 to 2015 as a normal range that farmers usually experience. The maximum temperature in this range is 33

degree Celsius, and the minimum temperature in this range is 14 degree Celsius. The call options in this paper are triggered if temperatures rise or drop above or below this range, making them useful against uncertainties. From this point of the paper, for ease of expression, we call this range “the threshold range”. (TRT)

In addition, the call options in this paper depend on the following assumptions:

- (i) In cooling harvest, if temperature rise by 2 degrees Celsius from TRT (which will damage the crop), it's worth exercising the option to act as an insurance mechanism.
  - (ii) Strike point is a temperature unit.
  - (iii) In heating harvest, if temperature drop below TRT by 2 degrees Celsius from TRT (which will damage the crop), it's worth exercising the option to act as insurance mechanism.
  - (iv) The crops grow accordingly to the temperature of each harvest. In this sense, farmers would only grow, harvest, and sell their products under two main harvest: Winter - Spring harvest and Summer - Fall harvest, which would translate into two 3-month type of call option contracts accordingly.
  - (v) Insurance coverage (IC) is in term of max loss (%) over the change in crop price per metric ton (mt) for long-positions; therefore, it will be  $0 < IC < 1$ .
- Based on the assumptions above, call option prices of Vietnam cities under research scope are summarized in Table 2.

From Tables 1 and 2, the call option prices could be interpreted in several aspects. First, the temperatures, at

**Table 2.** Call Option Prices. (Option price is USD where 1 USD = 23 255 VND).

		City	Strike temperature	Option price	Insurance coverage (%)
Winter-Spring Harvest		Thái Bình	28	0.209	48.67
		Nam Định	27	0.205	47.58
		An Giang	35	0.267	62.13
		Hải Dương	33	0.177	41.12
		Ninh Bình	30	0.238	55.25
		City	Strike temperature	Option price	Insurance Coverage
Summer-Fall Harvest		Thái Bình	24	0.155	32.88
		Nam Định	25	0.124	26.29
		An Giang	28	0.247	52.16
		Hải Dương	24	0.266	56.21
		Ninh Bình	28	0.313	66.2

Source: Authors' calculation.

which a contract in each city is exercised, fit into each city's seasonal climate. Since an exercise of options depends on anomalies of temperature, which in this case of our paper, the abnormal temperature will be 2 to 3 degrees above maximum or below minimum temperatures that the crops are prone to. The farmers by their experience and using this characteristic can easily monitor the timing their choice of contracts.

Second, the pricing process of Alaton model produces higher option prices in cool months (HDDs) and cheaper option prices in hot months (CDDs) as it expects a great concentration to mean temperatures. As a result, farmers can also vary in their choice of period in choosing options to sign. For instance, if farmers in An Giang expect to grow more crops in Summer-Fall harvest season, they can long call options in the period from May to August. Table 2 shows that call options in Summer-Fall are cheaper than those in Winter-Spring harvest, which can hedge farmers at least 52% of their production value. On the other hand, short positions can take chances against long positions. When An Giang farmers buy long positions, investors can create and short call options for Winter-Harvest harvest in the same or different cities where the gain is often the call option price.

Winter-Spring harvest, as shown in Table 1, depicts a much greater volatile nature than Summer-Fall harvest. This is a characteristic for Vietnam northern agricultural areas. Winter often brings highly unexpected coldness or heat, and irrigations fall short because of retreating Hong River. In this sense, given the hedging merits of option contracts in cities like Thái Bình or Ninh Bình, 40-60% of production value could be insured, in the absence of alternative protection means.

## HEDGING POWER OF TEMPERATURE-BASED DERIVATIVES

In this section we look at the hedging power of

temperature-based derivatives. At first, we examine the probabilities of irregular temperature happening in each city during harvest periods. By combining these probabilities with the option prices presented in Section 5, we present upside and downside cases to illustrate the extent of hedging power of Alaton model (2002) options. We conclude this section with a look at beyond-hedge values of temperature-based options, which provide cash for next-season production.

### Predicting the odds of adverse temperature

The study by Schiller et al. (2012) presents four models for weather derivatives, but stops at examining the performances of the models themselves. This approach is shared by Lu (2014) who tests the performance of Alaton model (2002) and CAR model by Benth et al. (2007) in China. However, the research by Kermiche and Vuillermet (2016) includes hedging indicators such as VaR for HDD and CDD contracts in several African cities, and thus it firmly highlights the practical usage of weather derivatives in hedging loss for farmers.

Here, we try to investigate further from the approach taken by Kermiche and Vuillermet (2016) by looking at temperature-based derivatives' usefulness in loss hedging. First, by using Alaton model (2002), we try to predict the 3-year-ahead likelihood of irregular temperatures from 2017 based on the following assumptions:

- (i) Applying the Alaton model (2002) functions to project 3-year-ahead temperatures according to each harvest period
- (ii) Using strike temperature 1-2°C above or below TRT. Each city has different strike temperature as shown in Table 2.
- (iii) The resulting likelihood is equal to the number of



**Table 3.** 3-year projection of irregular temperature probabilities.

Winter – Spring Harvest (%)		Summer – Fall Harvest (%)
Cities	Irregular temperature probability	Irregular temperature probability
Thái Bình	3.65	5.13
Ninh Bình	7.03	5.86
Nam Định	5.11	2.56
Hải Dương	6.57	5.13
An Giang	5.47	6.59

Source: Authors' calculation.

**Table 4.** Vietnam Rice Export Value 2009-2017.

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Export value per mt	\$407	\$420	\$514	\$440	\$446	\$464	\$408	\$435	\$450

Source: Vietnam Ministry of Agriculture and Rural Development, 2018.

periods at which temperatures meet or exceed the strike temperature divided by the total number of periods.

Table 3 indicates signs of relief for agriculture industries, showing that irregular temperature probabilities are still quite unlikely to take place. Nevertheless, this result does not reduce the insurance significance of call options. For instance, taking the example of Hải Dương in 18 days over 3-year periods, the model indicates temperatures that surpass those of TRT. At such time farmers might expect a week of abnormal temperature each harvest, which increases the odd that a crop's harvest could be reduced.

#### Upside and downside cases: how temperature-based options protect farmers

To illustrate the extent of hedging amounts, first we take into account the Vietnam 2017 rice export value. The rice export value is measured in USD per mt (Table 4).

In recent years, from 2013 onward, export rice price has been rising according to the Vietnam Ministry of Agriculture and Rural Development (MARD, 2018) largely due to the improved quality of the planted rice. This improvement is largely distributed to the ongoing efforts of farmers and manufacturers in choosing seeds and growing techniques. However, the quality and the rice export value are still subject to soil and weather factors. For instance, 2015 heavy heat and drought reduced production quantity and decreased quality by large. Therefore, the use of derivatives like call options will aid in reducing in loss value if unfavorable conditions are presented. We illustrate such a use in the upside and downside cases for Thái Bình city options, under the following steps:

- (i) Input of export quantity and value per mt for 2017
- (ii) Present 3 situations in which rice price per mt drops or rises by 1, 2 and 3 standard deviations from the mean export price per mt of the 2009-2017. Standard deviation(s) from the mean is denoted by  $k(s)$ .
- (iii) Identify the currency value of the amount hedged by the call options presented in section 5.
- (iv) Present upside and downside cases of export rice

Since a long position for dropping price is similar to a short position for rising price, we are taking a long position stand (Table 5). Long positions are farmers and rice manufacturers, who will face a possible drop in price, which is 1, 2 and 3  $k$ , accordingly. These changes in price are assumed and thus can be different in reality. The rise or drop in price, under the scope of this paper, is mainly due to irregular temperature patterns. Taking the case of Thái Bình city, a farmer who longs a 3-month call option before export will experience these two cases.

#### Upside case

Export price per mt drops 1, 2, and 3  $k$ . The farmer is entitled to maximum losses of \$16.01, \$32.03 and \$48.04 per mt, respectively. These translate into max losses of \$96mn, \$192mn and \$288mn, respectively. Because 2017 total rice export value (MARD, 2018) was nearly \$3bn, call options could have hedged losses for nearly 10% of total export value. On the other hand, the short positions can earn respectively the hedged losses valued. In other words, if long and short positions are parties of the same country, we can expect a net cash outflow from the country owing to negligible change in price.

**Table 5.** Simulated hedged values over 2017 Vietnam Rice export value.

	2017 Total Vietnam export value			\$2,700,000,000			
	Situations		Export (mt)	Value hedged			
	1k	2k		3k	1k	2k	3k
Thái Bình	\$16.01	\$32.03	\$48.04	6,000,000	\$96,089,668	\$192,179,336	\$288,269,004
Nam Định	\$15.66	\$31.31	\$46.97		\$93,937,670	\$187,875,340	\$281,813,010
Hải Dương	\$13.53	\$27.06	\$40.59		\$81,183,627	\$162,367,255	\$243,550,882
Ninh Bình	\$18.18	\$36.36	\$54.54		\$109,080,628	\$218,161,256	\$327,241,884
An Giang	\$17.16	\$34.33	\$51.49		\$102,980,010	\$205,960,020	\$308,940,030

Source: Authors' calculation.

**Table 6.** Beyond-hedge value.

Beyond-hedge value			Seed quantity at \$63.8 per mt (ton)		
1k	2k	3k	1k	2k	3k
\$16.9	\$33.8	\$50.7	0.265	0.529	0.794
\$17.2	\$34.5	\$51.7	0.270	0.541	0.811
\$19.4	\$38.7	\$58.1	0.304	0.607	0.911
\$14.7	\$29.5	\$44.2	0.231	0.462	0.692
\$15.7	\$31.5	\$47.2	0.247	0.493	0.740

Source: Authors' calculation.

### Downside case

In reverse of upside case, when export price increase greatly (and in reality, they did from 2014-2017), the farmers can choose not to exercise the call options and only earn money from the rice. Otherwise, they can choose to exercise the contracts and earn the spread. The spread here is the difference between a favorable temperature and the call option's strike temperature (Table 2) multiplied by the option price per mt. We will also discuss the social economic implications of this high gain case in 6.3.

### Beyond-hedge gains for farmers and investors

Table 6 presents one of many uses besides hedging of temperature-based call options. Schiller et al (2012) stated: "Since weather variables are mostly uncorrelated with the classical financial market, weather derivatives form the only possibility on the financial market of insuring against unfavorable weather. The development of the weather derivatives market assumes that an increasing number of corporations take advantage of these new opportunities".

In addition to hedging mechanisms, the value once hedged provides good back up cash for next-season or future production. This back up cash is what we call "beyond-hedge" value of temperature-based options. Taking the second line of Table 6, a Thái Bình city, for example, when the export price drops 1k, the remaining

value after the losses is \$16.9 per mt. This money can be effectively used to buy 0.265 mt of high-quality type seeds, and stored for use in the future. For this concern, we argue that since there is not a trading market for agricultural derivatives in Vietnam at the moment, their many uses are often overlooked. Table 6 shows that a call option not only helps farmers avoid taking the full-size losses but also frees up cash from such losses in price, providing backup capital for use, like buying seeds for the next harvest. In favorable temperature and price conditions, farmers as long positions also gain what could be called a non-operational profit, which comes from upside price gains rather than from crop production value.

### POLICY IMPLICATIONS

Kermiche and Vuillermet (2016) conclude that weather derivatives can be included in a long-term sustainable plan to hedge temperature risk in African countries. Investigating the argument, we have shown the hedging capabilities of weather derivatives in Vietnam in Section 5 and Section 6. Farmers can both protect their production value and gain profits with Alaton model (2002) temperature-based options, provided that a real market exists. Such a market will allow capital flows from the financial market to a commodity-based market. It will provide not only indirect profit opportunities for non-agricultural investors, but also choices for farmers to hedge temperature risks.



Therefore, this section considers policy implications for non-agricultural players, such as investors and regulators on an exchange market. We would like to demonstrate the necessary factors for a viable option trading market in Vietnam and other emerging markets: the market price of risk, clearing houses, investment banks, insurance companies, and structured derivatives. Moreover, based on our experience about Vietnam and reports from SSC (2018) and GSO (2018), we look at some barriers that might undermine the creation of temperature-based derivatives market in Vietnam. Once these barriers are overcome in the near future, Vietnamese farmers may be able to use temperature-based derivatives to deal with changing climate.

### **Market price of risk and implications for non-agricultural players**

The market price of risk, or the extra return an investor wants usually reflects the hope for beating non-systematic factors such as inflation (described by inflation premium in the CAPM model), or business risks. In a similar aspect, a temperature-based option offers a premium above irregularities in temperature. While farmers are expected to be effectively hedged against losses using temperature-based derivatives, other non-agricultural earnings can be various.

Given that there is an actively traded market for temperature-based derivatives and a derivative contract is in its effective period, one initial option contract can change hand multiple times, through which secondary sellers and buyers bet their luck and gain profits. For instance, with Nam Định options priced at VND4758 per mt, the primary short-position can bid and sell the contract in a secondary market at par. Under the Alaton model price, Nam Định option is priced at VND4758 at an interest rate of 6.5%, and VND7425 at an interest rate of 6%. A speculative secondary investor, having expected this 0.5% drop in interest rate, can ask for the contract at VND5000. The investor can later sell it at VND6000 to make a non-exercise profit at VND1000. When this process continues with or without the initial contractors exercising it, profit can grow gradually.

Furthermore, temperature-based contracts can be included in investment portfolios. Singal (2017) wrote “commodity futures provide the diversification benefit in combination with equity and bond in the portfolio” and “they can be used as excellent hedging tools against inflation”. In the portfolio context, temperature-based options provide more freedom than futures, since exercising the option is optional, bringing somewhat a “temperature related risk premium” in the traditional portfolio of equity and bonds. Although there is a need for a real market to certify this attribute of Alaton model temperature-based derivatives, we believe that the results should be similar to existing price-underlying or interest-underlying futures or options.

### **Policy implications for market regulator**

The main limit of temperature-based derivatives in Vietnam is the lack of a real market. The lack of an official trading platform poses an obstacle for potential market players to determine the suitable price ranges. Moreover, as discussed earlier, the benefits of temperature-based to farmers and non-agricultural players are explicit: the derivatives are not only easy to understand, use and monitor, but also suitable to act as a bridge connecting farmers with capital and insurance market. Therefore, we propose that the Vietnam government, especially the SSC, create a market for agricultural temperature-based derivatives through these following steps:

#### ***Step 1: Strengthen the emerging market***

We acknowledge that the Vietnam equity market is still in the process of development. By 2017, Morgan Stanley Capital International (2017), still categorized Vietnam as a frontier market. This is mainly due to the restricted foreign investment into listed Vietnam companies, and also the lack of complex financial products, such as commercial bank securities or derivatives. However, since 2016, both the Ho Chi Minh stock exchange (HOSE) and Hanoi stock exchange (HNX) – the two stock exchanges in the country, have taken efforts to launch futures and warrants. These derivatives, though quite new to the market and stock-underlying, received huge investment. According to the SSC (2018), by July 2018, there are 35,725 active transaction accounts whose values are up to VND4.7 trillion (+50%YoY). Among these accounts, domestic investors account for over 98%, signifying the curiosity of domestic investors towards more complex investment tools.

In this sense, given a still agricultural-based economy, we believe that the market acceptance of temperature-based options will be promising. As for any financial product to be introduced, we suggest the SSC work closely with the Ministry of Agriculture and Rural Development and the Ministry of Finance to collaborate in the collection of harvest timing data, temperature data, rice and related main crops data, export value data, and insurance policies. We expect such cooperation will result in a concrete and real-time database for temperature-based derivatives (in our case, the Alaton model options).

#### ***Step 2: Create a market of options, and involve players***

Once chosen an acceptable pricing model, e.g., Alaton temperature-based model, Agribank one of the four largest banks in the country can support the creation of the clearing house and investment banking of the temperature-based derivatives market. Since Agribank is a state-owned commercial bank, created by the Vietnam

government to infuse credit for agriculture production, it will be capable of providing the capital needed to facilitate the underwriting of new options, asking and bidding, also provisions for long-short party gains and losses.

Next, we recommend Agribank work closely with securities and brokerage firms to market the option contracts to farmers and non-agricultural investors. The marketing process can involve workshops, simulated trading platforms and discounts for first-time users. According to GSO, in Quarter 1, 2018, labor in agriculture is 20.9 million, accounted for nearly 39% of total 15-year-and-older labor force. It would be unrealistic to have all agriculture workforces buying the contracts, but we expect at least 100,000 accounts joining the market (approximately 0.5% of agriculture labor force) once the market is established. This will be about three times the number of accounts currently joining stock-underlying futures.

### **Step 3: Extend and evaluate**

Our proposed temperature-based option contract can be extended in several ways. Instead of using temperature as the underlying asset, Agribank and brokerage firms can create other options whose underlying assets are humidity, average sunlight hour, and so on. Similar to temperature, those are climate elements encompassed in the agricultural production and can be easily monitored by farmers. Farmers, having a diverse base of underlying, will have more freedom in choosing the right hedging tool specifically for their crops.

On the other hand, options, just like stocks or mortgage, can be pooled together as collaterals for commercial-back securities (CBS). We expect the introduction of CBS will elevate the complexity of Vietnam market and make it more attractive to foreign investors. As a result, by virtue of temperature-based derivatives, Vietnam might be able to see its market rank elevated to emerging market, or even a developed one. In short, we see agricultural temperature-based options as a great bridge that links the agriculture sector more closely with the financial sector, a relationship that fuels Vietnam economy to a more horizontal growth across sectors.

### **Barriers to temperature-based derivatives market in Vietnam**

Although we try to put forth a step-wise action framework for market regulators in 7.2, we recognize that there are several existing barriers which hinder the creation of an attractive temperature-based derivatives market in Vietnam. The first barrier is the limited financial knowledge of potential market players, e.g., farmers. According to GSO (2018), among the 15-year-old-and-older labor force, only around 20% are trained workers from

industrial schools and colleges. Educating and convincing farmers in this 20% to join financial markets are already challenging and time-consuming tasks.

The second barrier is the currently strong foreign influence on Vietnam stock market. According to SSC (2018), foreign investors account for around 60.7% total stock market transaction value. This means that the Vietnam stock market is extremely sensitive to foreign investment. We observed that from March to July, 2018, when foreign investors withdrew from Vietnam and other emerging markets in fear of imminent Trump-provoked trade war, VN-Index (Vietnam general market index) dipped from 1201 basis points to 898 basis points, but it recovered in September, 2018 to 1024 basis points when foreign capital flooded back in. Broadly speaking, the acceptance of a temperature-based derivatives market depends greatly on foreign investors' decision, whereas we are not able to recognize that SSC can convince them to invest.

The last barrier is the perceptions of Vietnamese farmers, which are probably the hardest to tackle. To our best knowledge, most Vietnamese farmers think and produce crops according to annual harvest, which is short-term. They tend not to have backup plans to hedge against unexpected events. Therefore, a risk-hedging product like temperature-based options might not be attractive to farmers. Without our target users, a temperature-based derivatives market simply cannot exist. In short, despite the promising benefits of temperature-based options, we need to have continuous efforts to create it.

### **Conclusion**

Despite the fact that there is not a real market for weather derivatives, we see great potential for them, especially temperature-based options. We also note that, while weather elements are uncorrelated with the equity market, they can be easily monitored by farmers in the production process. We expect that, owing to this ease-of-use, even farmers with insufficient financial skill will find weather derivatives attractive enough to utilize them as risk hedging methods. Thus, we hope the introduction of weather derivatives into Vietnam market will engage more agricultural players with the equity market, from which both sectors can see great upside potentials.

In addition, our results showed that the pricing results vary among the provinces. We see this as a province-specific use of temperature-based derivatives. Every city in Vietnam can create option contracts suitable for their climate and agricultural production pattern. This suits greatly to the country of vast climate diversity from north to south. In addition, the SSC and related parties can create markets and complex financial products from our proposed temperature-based options, which will act as an elevator to improve the health of Vietnam financial

system. However, market regulators must overcome several barriers in order for temperature-based derivatives market to exist.

Technically speaking, further research can extend the depth of our study by applying more complex model than Alaton model. For instance, Spline model by Schiller et al. (2012) separates the daily temperature data  $T_t$  into a trend and seasonality component in the mean, and captures daily temperature variations. The underlying assets are various ranging from temperature to precipitation level, which can also provide good cases for future studies. Finally, the Alaton model (2002) can be applied to countries neighboring Vietnam which are too agricultural intensive such as Thailand or Myanmar, where we expect the use of weather derivatives can also be applied.

### CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

### REFERENCES

- Alaton P, Djehiche M, Stillberger D (2002). On Modelling and Pricing Weather Derivatives. *Applied Mathematical Finance* 9(1):1-20.
- Benth FE, Saltyte-Benth J, Koekebakker S (2007). Putting a Price on Temperature. *Scandinavian Journal of Statistics* 34(4):746-767.
- Cabrera BL (2009). Pricing of Asian temperature risk (Master's thesis, Humboldt-Universität zu Berlin, Faculty of Economics).
- General Statistics Office of Vietnam (2017) and Quarter 1. Labor report. Available at: <http://www.gso.gov.vn/default.aspx?tabid=382&idmid=&ItemID=18667>
- General Statistics Office (GSO) (2018). Labor report. Available at: <http://www.gso.gov.vn/default.aspx?tabid=382&idmid=&ItemID=18667>
- Goncu A (2011). Pricing Temperature-Based Weather Derivatives in China. *Journal of Risk Finance* 13(1):32-44.
- Kermiche L, Vuillemermet N (2016). Weather derivatives structuring and pricing: a sustainable agricultural approach in Africa. *Applied Economics* 48(2):165-177.
- Heimfarth LE, Musshoff O (2011). Weather index-based insurances for farmers in the North China Plain: An analysis of risk reduction potential and basis risk. *Agricultural Finance Review* 71(2):218-239.
- Liu X (2006). Weather Derivatives: A Contemporary Review and Its Application in China. M.Sc. Dissertation, University of Nottingham.
- Lu Z, Ender M (2014). Model Comparison for Temperature-Based Weather Derivatives in Mainland China. *Emerging Markets Finance and Trade* 50(5):68-86.
- Morgan Stanley Capital International (2017). Market Cap Indexes. Available at: <https://www.msci.com/market-cap-weighted-indexes>
- Schiller F, Seidler G, Wimmer M (2012). Temperature models for pricing weather derivatives. *Quantitative Finance* 12(3):489-500.
- Singal S (2017). Emergence of commodity derivatives as defensive instrument in portfolio risk hedging: a case of Indian commodity markets. *Studies in Business and Economics* 12:1.
- State Securities Commission of Vietnam (SSC) (2018). Stock exchanges reports. Available at: [http://www.ssc.gov.vn/ubck/faces/vi/vimenu/vipages\\_vithongtinhtruong/thongkettck2](http://www.ssc.gov.vn/ubck/faces/vi/vimenu/vipages_vithongtinhtruong/thongkettck2)
- Vietnam Ministry of Agriculture and Rural Development (MARD) (2018). Statistics report. Available at: <https://www.mard.gov.vn/Pages/bao-cao-thong-ke.aspx>

*Full Length Research*

# **The impact of money laundering in beautiful places: The case of Trinidad and Tobago**

**Lester Henry\* and Shanice Moses**

Department of Economics, Faculty of Social Sciences, University of the West Indies, Trinidad and Tobago.

Received 12 December, 2019; Accepted 2 March, 2020

**This paper investigates the relationship between money laundering and economic growth in Trinidad and Tobago. It utilizes annual secondary time series data for the period 1990 to 2017. The proxy of fraud offences and narcotics is used to estimate the volume of money laundering. Cointegration analysis and Error Correction Modelling is employed to test the long-run and short-run relationship between money laundering and economic growth. Long-run analysis revealed that there is a positive significant relationship between fraud offences and economic growth while narcotics offences maintained a negative significant relationship with economic growth. In the short-run, estimations revealed that only fraud offences had a significant negative impact on economic growth.**

**Key words:** Money laundering, economic growth, Trinidad Tobago, Caribbean.

## **INTRODUCTION**

This paper examines the issue of money laundering and its impact on the Trinidad and Tobago economy. Trinidad and Tobago have been branded as a major money laundering country by the 2018 International Narcotics Control Strategy Report. This was harmonized by the Basel Anti-Money Laundering (AML) Index 2017 Report. The country received a Basel AML Index of 6.8 placing it in the high- risk category of countries vulnerable to money laundering. Accordingly, it was ranked the 35th highest risk country prone to money laundering out of 146 countries worldwide. The country received a ranking of the 5th highest risk country susceptible to money laundering in the Latin American and the Caribbean region after Paraguay, Haiti, Bolivia and Panama which received Basel AML Indices of 7.53, 7.50, 7.17 and 7.01

respectively. The Basel AML Index 2017 Report distinctly identified five factors which constituted a high- risk ranking in the Basel AML Index. These factors included a high-level of perceived corruption, shortfalls in the AML/ Combating Terrorist Financing (CFT) framework, poor financial standards, lack of public transparency and weak political rights and rule of law.

There is a lack of empirical research which assesses the impact of money laundering on the economic stability and welfare within the Caribbean and more specifically, Trinidad and Tobago. The increasing risk of money laundering should necessitate consistent updating of pragmatic research efforts to follow and examine any ongoing trends which may be linked to money laundering. Although it is intrinsically challenging to measure and

\*Corresponding author. E-mail: Lester.Henry@sta.uwi.edu.

assess the impact of money laundering on an economy, this study endeavours to combine both existing economic theory and prior empirical studies to formulate an appropriate model to explain Trinidad and Tobago's experience of money laundering.

This paper uses cointegration and error correction analysis to test both the short-run and long-run relationship between money laundering and the economic growth using time series data for the period 1990-2017. Two variables are used as money laundering proxies; narcotics offences and fraud offences, in the econometric model as they were assumed to generate adequate volumes of illegal proceeds which require laundering.

The paper is structured into five sections. This first section provides context to why it was vital to explore the issue of money laundering in Trinidad and Tobago. Then there is a brief survey of literature. The third section looks specifically at the economic environment which may possibly be conducive to money laundering. Section 4 discusses the data, the methodology and the model used to examine the short-run and long-run impact on economic growth. Section 5 concludes and proposes some policy recommendations.

## LITERATURE REVIEW

### Money laundering and the macro-economy

There have been several international studies which examined the relationship between money laundering and economic growth. For example, Argentiero et al. (2008), in their case study of Italy, the analysis suggested two main results. First, money laundering accounts for approximately 12 percent of aggregate GDP. Secondly, money laundering is negatively correlated to GDP and it is more volatile than aggregate GDP itself. Stancu and Rece (2009) examined data collected from USA, Russia, Romania and eleven other European countries, using a linear regression model. Their results supported the hypothesis that money laundering can lead to short-run economic benefits. These findings contradicted the prevalent hypothesis that money laundering and economic growth are inversely related. Using an annual dataset spanning from 1985-2013, Villa et al. (2016) estimated the volume of laundered assets in the Colombian economy. Their results confirmed that the volume of laundered assets increased from about 8 percent of gross domestic product in the mid-1980s to a peak of 14 percent by 2002 and declined to 8 percent in 2013. Bett and Muturi (2016) utilized dynamic ordinary least squares to estimate the relationship between economic crimes and economic growth. Annualized data from the period 2000-2014 were used. Findings confirmed a strong negative and significant relationship between illicit financial flows and economic growth in Kenya both in the short and long run. Barone et al. (2017) analysed

the influence of the business cycle on illicit capital, money laundering and legal investment at the macro level. It was concluded that as legal capital is accumulated by organized crime, a decelerating growth trend is observed. The stagnation assumption can be said to hold for the illegal economy. Results showed that illegitimate capital is affected by the business cycle mainly through the capital multiplier, which in turn depends on the interest rate path.

More recently, Hetemi et al. (2018) evaluated the impact of money laundering on economic growth concentrating on Republic of Kosovo and its trade partners. Using data from 2008-2015, a GMM technique was employed. They tested three hypotheses: one, whether money laundering has an effect on the level of economic growth; two, whether the effect of money laundering on economic growth was negative, and three, whether the increases in crime, corruption and informal economy decreases economic growth. Results supported the hypothesis that money laundering has a significant and negative effect on economic growth. These results are consistent with past literature. They also found that the informal economy and corruption have a negative and significant effect on economic growth. Whilst, the consequence of the number of crimes was not as anticipated, it was found to be statistically insignificant.

To date, there are only two non-published studies which have attempted to use econometric analysis to access the impact of money laundering in the English-speaking Caribbean. These studies include those of Gray-Farquharson (2007) which provided an empirical assessment for the period 1972-2005 of the impact of money laundering on the financial system and economy of Jamaica. Sectioned into two parts, first, the relationship between money laundering and economic growth was tested. Using cointegration and Vector Error Correction model (VECM) methods, the results revealed a positive and significant relationship between the economic growth and money laundering in Jamaica in the long run. Thereafter, she estimated how money laundering activities affected the Jamaican financial system. Using the money demand variable as the proxy representative of the financial system, the results indicated a positive relationship between money demand and money laundering. Results suggested that the persistence of money laundering has the ability to threaten the financial stability of Jamaica which can consequently affect economic growth.

Subsequently, Jones (2015) attempted a similar analysis for the case of Trinidad and Tobago. She investigated the effects of money laundering on economic and financial stability using an annual time-series data for the period 1990-2014. Cointegration and error correction models were also used to estimate the long run and short run relationships between money laundering and the financial system and the economy. Additionally, the Granger causality test was performed to determine the

direction of causal flow among the variables. Two variables were used to represent the money laundering phenomenon; drug trafficking and fraud, as they were assumed to generate sufficient volumes of proceeds which necessitated laundering.

The results confirmed a positive and statistically significant relationship between the money laundering proxy, drug trafficking and economic growth, while a negative one existed between the proxy, fraud, and economic growth. Interestingly, in the Trinidad and Tobago setting, it was confirmed that a negative and significant relationship exists between the money laundering variables and the money demand. Using the Granger Causality test, it was suggested that both drug trafficking and fraud were found to Granger cause economic growth, whilst only fraud was found to Granger cause money demand.

### **THE ENVIRONMENT FOR MONEY LAUNDERING IN TRINIDAD AND TOBAGO**

Referenced as an ideal “cocaine and marijuana transshipment” point by the US Department of State, Trinidad and Tobago are susceptible to several transnational criminal activities involving both domestic and international organised criminal individuals and organizations. The country is located just about 7 miles off the Venezuelan coast, and given the recent troubles, it is not surprising that there are spill over effects. Much of this activity revolves around the informal economy. Studies have shown that the informal economy represents a significant segment of the country’s economic activity. The informal sector accounts for between 26- 33% of total economic activity (Peters, 2017). This estimate by Amos coincides with previous approximations, 35% of GDP (Schneider et. al 2010), 25% of GDP in 2000 (Vuletin 2008) and the earliest estimation of the informal economy found was 20% of GDP in 1999 (Maurin et al., 2006).

Corruption has been strongly linked to money laundering. The 2017 Corruption Perception Index (CPI) ranked Trinidad and Tobago as the 77th least corrupt country out of 180 countries, with a CPI score of 41/100 in 2017. This had slightly increased from 35 points in 2016. However, a CPI of 41 points still indicates that the country is perceived relatively corrupt. Trinidad and Tobago’s CPI score falls short of the internationally acceptable average score of 43 (TTTI, 2018). A high predisposition to corruption has serious implications, exposing the country to the risk of money laundering. Corrupt persons and institutions make the process of money laundering easier to conceal illicit proceeds.

The lack of effective investigation and prosecution of financial crimes in Trinidad and Tobago makes it an attractive location to launder illicit funds without severe

consequences. There has been no adjudication or criminal convictions for the offence of money laundering in Trinidad and Tobago. Consequently, the country has received low ratings for compliance by CFATF. The cases presently before the courts are predicate crimes of: fraud, illegal gambling, drug trafficking, larceny servant, corruption, robbery, conspiracy to defraud and falsification of accounts. The FIUTT (2017) highlighted that the effectiveness of money laundering investigation and prosecution was low. The CFATF Mutual Evaluation emphasized that “the lack of ML arrests coupled with the risks associated with the jurisdiction along with the lack of priority given to investigation suggests that the offence of ML is not properly investigated” (CFATF, 2016, 6). Swift convictions of individuals for financial crimes can act as a preventive measure in decreasing the probability of money laundering occurring within Trinidad and Tobago. Although, there has been multiple charges laid against persons, no individual has faced the full brunt of the law for the criminal act of money laundering. As such, the CFATF declared that the crime of money laundering is not given priority within the Court system of Trinidad and Tobago.

Like in many other countries, there is a pronounced disparity between the punishment associated with white-collar crimes and blue-collar crimes. Money laundering falls within the realm of white-collar crime. More leniency is granted to white-collar criminals by the judicial system in Trinidad and Tobago. The variance in treatment of white-collar criminals in Trinidad and Tobago occurs in the form of a “failure to press criminal charges, delayed investigation and state protection of the elite” (Kerrigan and Sookoo, 2013, 165). Violent crimes received more severe punishment in terms of prison sentences and fines imposed when compared to white-collar crimes even though white-collar crime has a greater financial cost and much more victims impacted as opposed to “violent street crimes”. Unfortunately, these implications are not reflected in the punishment of white-collar crime.

The following section highlights the high-risk sectors prone to the occurrence of money laundering. Observing that some sectors were more vulnerable than others to the risk of money laundering, the FIUTT adopted a risk-based methodology to supervision and identified five high-risk sectors amongst Listed Businesses (LBs): Attorneys-at-law, Accountants, Private Members Clubs, Real Estate and Motor Vehicle Sales which were deemed as exposed to a higher occurrence of money laundering. Other sectors apart from those listed as high risk which are of equal importance to understanding the threat of money laundering were discussed.

### **Sectors susceptible to money laundering in Trinidad and Tobago**

One of the most susceptible areas of money laundering

globally is the financial sector. Trinidad and Tobago have one of the most sound, well-developed financial sectors in the Caribbean region. It is highly liquid banking, stock market, insurance sectors, has been the most dominant in terms of expansion into other CARICOM markets. Therefore, it is a net capital exporter to neighbouring states.

The banking sector is seen as the “gatekeeper” of the financial sector (CFATF 2016, 72). However, as Seuraj and Watson (2012) emphasized, banks in their daily operations are predisposed to several risks which, if not managed or controlled, may result in unfavourable implications for the entire economy. In Trinidad and Tobago, banks are cognizant of the money laundering risks which exist and the associated AML/CFT requirements, especially as the country is frequently struggling to get itself off various “black lists”. The sector has been extra vigilant in ensuring that the risk of money laundering is minimized. The CFATF explained that four of the commercial banks operating within Trinidad and Tobago are each part of an international group headquartered in North America where domestic banking operations in Trinidad and Tobago are subjected to a more stringent AML/CFT requirement than the home country.

The banking sector is heavily regulated by the CBTT (Central Bank), supported by the Securities Exchange Commission (TTSEC), with suspicious transactions being monitored by the FIUTT (Financial Intelligence Unit); all in an effort at minimizing the risk of money laundering through this channel. It must be acknowledged that, unlike many of its neighbours, Trinidad and Tobago do not have a large and thriving offshore financial sector. However, many of these Caribbean countries with vibrant offshore banking operations have been scrutinized and criticized for fuelling unacceptable and criminal behaviours such as tax evasion, tax avoidance and money laundering.

Attorneys-at-law, accountants and real estate agents are the architects behind several activities including but not limited to facilitating the exchange of ownership of assets, management of client’s money, securities and other assets, facilitating financial transactions, provision of financial and legal advice inter alia. Attorneys, accountants and real estate agents are privy to sensitive legal and financial information related to their clientele which may be able to help in the fight against money laundering. Strict AML coverage must include these professions to improve the country’s image in the eyes of international agencies. Attorneys, accountants and real estate agents are obligated to act both ethically and within the confines of the law. These professionals are expected not to aid and abet clients with committing the crime of money laundering or any of its predicates. It is imperative that attorneys, accountants and real estate agents are able to detect and report any suspicious

activities in which they may encounter in their professions. Listed businesses’ supervision falls under the purview of the FIUTT in the initiative to combat money laundering. There is much room for improvement in the regulation of this sector in Trinidad and Tobago.

The FIUTT (2018) has categorized the real estate sector in Trinidad and Tobago as the one most vulnerable to the risk of money laundering. The real estate sector is used to convert “dirty money” into a secure and long-term investment. The ownership of real estate creates a façade of respectability, legitimacy and normality for scheming criminals engaged in obscuring the proceeds from their criminal activity. This method is commonly used in the integration stage of the money laundering process.

On an annual basis via the FIUTT Annual Reports, suspicious activities have been reported to be recurring within the real estate sector. Notably, the real estate sector involves large volumes of funds and multiple parties engaged in every single real-estate transaction. This creates additional layers in the concealment of illegal proceeds making it tremendously challenging to detect property dealings and transactions connected to money laundering. Consequently, the globalisation of the real estate market makes it even more difficult to identify real estate transactions associated with money laundering especially when potential owners can be elusive international criminal elements.

Money laundering creates distortions in the real estate market such as unexplained increases in the demand for real estate. This inexplicable demand creates an upward pressure on real estate prices which leads to spiralling real estate prices (CBTT, 2007). This impacts a large cross-section of prospective buyers as the market prices are inflated, and in some cases deflated, due to the manipulation of the real estate market to ensure that there is little suspicion of the high volume of illegitimate proceeds being channelled into the sector.

A major drawback in the fight against money laundering in Trinidad and Tobago is that LBs, particularly those in the real estate, do not possess a comprehensive understanding of money laundering risk or the scope and depth of actions necessary to alleviate varying money laundering risks in this sector. Furthermore, it was noted that real estate agents have not properly analysed their money laundering risk, nor have they adequately applied mitigating measures commensurate with their risks (CFATF, 2016). Much improvement in risk assessment, monitoring and enforcement of anti-money laundering policies by all stakeholders is required to minimize the occurrence of money laundering within this sector.

Money launderers can easily convert illegal proceeds through the used-car industry or the motor-vehicle sales industry by procuring motor vehicles especially through cash transactions to legitimize unlawful earnings. The purchase of luxury vehicles is done to conceal “dirty”

money within the real economy. According to the United States Department, law enforcement (2017; 2018) sources indicated that incomes from the black-market sale of firearms and suspicious sales of smuggled used luxury vehicles rival income from local drug sales.

Trinidad and Tobago remain one, if not the only country, with a thriving gaming sector that is completely unregulated. The allure of the high cash-intensive nature of casinos makes it a perfect “playground” for money launderers worldwide. In Trinidad and Tobago, public casinos and online gaming are all illegal. However, casinos have been operating under the guise of Private G Club (PMC). Though the supervision of PMCs falls under the purview of the FIUTT, the non-existent regulations and poor controls which govern the operations of these types of organizations makes it a prime target for money laundering. Money launderers are able to exploit the “casino-like environment” of PMCs which handle large sums of money under archaic regulatory supervision presently followed in Trinidad and Tobago.

There is a significant presence of PMCs within Trinidad and Tobago which provide gambling activities through gaming tables and machines that are similar to casinos. The high-cash intensity of these institutions, the unscrupulous nature of the clientele which PMCs attract and the non-rigorous application of the AML/CTF requirements all signals a poorly regulated sector which make it highly susceptible to money laundering. There have been instances where some banking institutions have declined to conduct business with some of these PMC institutions because of the perceived high risks posed by this industry.

Noticeably, there is an inadequate AML/CFT regime within Trinidad and Tobago especially for the supervision of PMCs. There are no provisions in place which prevents criminals or their associates from holding key influential positions in a PMC or having a significant or controlling interest or holding a management function or being an operator of a PMC (CFATF, 2016).

Since November 2017, when Trinidad and Tobago made a high-level political commitment to work with the FATF and CFATF to strengthen the effectiveness of its AML/CFT regime and address any related technical deficiencies. Trinidad and Tobago have taken steps towards improving its AML/CFT regime, by proclaiming laws on NPO supervision and civil asset recovery. Trinidad and Tobago should continue to work on implementing its action plan to address its strategic deficiencies, by implementing: (1) the remaining measures to further enhance international cooperation; (2) the issues related to transparency and beneficial ownership; and (3) the measures to monitor NPOs on the basis of risk (FATF, 2019) (<http://www.fatf-gafi.org/publications/high-risk-and-other-monitored-jurisdictions/documents/fatf-compliance-june-2019.html>). On December 7<sup>th</sup>, 2019, the government announced a move to de-monetise the entire stock of \$100 bills in 2

weeks. The bills were replaced by new polymer notes. The stated purpose of the action was to prevent money laundering, fraud and corruption.

## METHODOLOGY

Money laundering is a challenging economic problem to model as its monetary value cannot be easily quantified. Nevertheless, Cointegration analysis and an Error Correction Model (ECM) were used here to examine both the short run and long run relationship between money laundering and economic growth. Secondary time series data, for the period 1990 to 2017<sup>1</sup>, were obtained from various databases, including: the Central Bank of Trinidad and Tobago (CBTT), Handbook of Key Economic and Financial Statistics, the Central Statistical Office (CSO) of Trinidad and Tobago, the Crime and Problem Analysis Unit (CAPA) of the Trinidad and Tobago Police Service (TTPS), the World Bank's World Development Indicators and the United Nations (UN).

The following is the general form of the model used in the analysis:

$$RGDP = f(FRD, NAR, INF, GFCF)$$

Where, Real GDP = The dependent variable; FRD = fraud offences, expected to be positively related to with money laundering, negatively related to GDP; NAR = narcotics offences, narcotics offences can have a negative impact on the economic stability and growth of a country; GFCF = Gross Fixed Capital Formation measures investment. Based on the premise that economic growth is not possible without an increase in capital formation, this implies that investments will have a positive impact on economic growth; INF = Inflation, money laundering can cause fluctuations in the demand for cash, making interest and exchange rates more volatile, and thereby triggering high- levels of inflation.

## FINDINGS AND DISCUSSION

In order to prevent the occurrence of spurious results, the Augmented Dickey Fuller (ADF) was used to test for stationarity of all variables included in the model. Using the Schwarz criterion for the optimal lag selection process, it was determined that one lag should be included in the model. The results of the ADF tests are summarized in Table 1. The Gross Fixed Capital Formation, Narcotics offences and Inflation variables were determined as I(1) or integrated of the first order at the 5% level of significance. However, both the real GDP and Fraud offences variable were found to be integrated of the second order or I(2), as seen in Table 1.

Due to the small sample size, the t-statistics are not valid as the large sample properties do not hold. The p-value criteria at a 5% significance level were used to determine the stationarity or order of integration of the variables. Owing to the sporadic nature of the time series, the intercept and trend assumption would be adopted as the most appropriate test for stationarity.

<sup>1</sup> This sample period; 1990- 2017, was constrained by the availability of data which was sourced from the APA Unit of the TTPS as there were no available crime data prior to the year 1990.



**Table 1.** Augmented Dickey Fuller Unit Root Test results.

Variables	Augmented dickey fuller test						
	Level		First difference		Second difference		Order of Integration
	Trend and Intercept	Intercept	Trend and Intercept	Intercept	Trend and Intercept	Intercept	
RGDP	0.9996	0.5343	0.2659	0.1845	0.0000*	0.0000*	
LNGFCF	0.3547	0.2877	0.0024*	0.0000*			I(1)
LNINF	0.0820	0.0000*	0.0000*	0.0000*			I(1)
LNFRD	0.3326	0.1255	0.9689	0.0000*	0.0005*	0.0000*	I(2)
LNNAR	0.4159	0.5769	0.0017*	0.0002*			I(1)

\*\*\* indicates stationarity; p-value < 0.05.

**Table 2.** Johansen procedure cointegration test results for logged variables.

Unrestricted Cointegration Rank Test (Trace)			
Null	Alternative Statistic	0.05 Critical Value	P-Value
r=0	r≥192.96219	69.81889	0.0003
r≤1	r=247.20599	47.85613	0.0575
Unrestricted Cointegration Rank Test (Maximal Eigenvalue)			
r=0	r=145.7562	33.87687	0.0012
r=1	r=222.21632	27.58434	0.2095

Where r is the number of cointegrating vectors. Decision Rule: Reject the null hypothesis in favour of the alternative hypothesis if the p-value is less than 5% until we fail to reject null hypothesis. It must be noted that the process limited to null hypothesis:  $r = N - 1$ ; where N is the number of variables included in the model.

LNGFCF, LNNAR and LNINF were I(1) or integrated of order one whilst LNFGDP and LNFRD were I(2) variables or integrated of the second order. In this study, both LNFGDP and LNFRD were I(2) variables which meant that jointly they form an I(1) process and can be combined with LNGFCF, LNNAR and LNINF, I(1) variables, to test for cointegration, satisfying the condition that all variables be integrated of the same order.

The results from the trace test indicated that there is only one cointegrating equation at the 5% level of significance which was validated by the max-eigenvalue statistic test. This implies that there is in fact a long-run relationship between real GDP, gross fixed capital formation, fraud offences, narcotic offences and inflation (Table 2).

From the above, the cointegrating equation is given as:

$$\ln r_{gdp} = 0.431523 \ln r_{gfcf} + 0.067631 \ln r_{frd} - 0.329627 \ln r_{nncar} + 0.116430 \ln r_{ninf}$$

The signs are reversed because of the normalization process. All independent variables included in the model were statistically significant, as the estimated p-values related to the coefficients were all less than the 5% significance level; (0.02616), (0.04868), (0.04124) and

(0.04327).

Results show that the long-run estimated relationship between GFCF and real GDP is positive which aligns with the a priori expectations. The inverse relationship between narcotics offences and RGDP verifies the negative a priori expectation. On the other hand, the positive estimated long-run relationship between fraud offences and RGDP and inflation and RGDP contradicts the a priori expectations. This inconsistency suggests that an increase in fraud offences has the ability of increasing the real GDP of Trinidad and Tobago in the long run. Similarly, the positive relationship between inflation and real GDP implies that increases in the rate of inflation increases the real GDP.

### Error correction modelling

Given the variables are cointegrated; it suggests that there exists an adjustment process which prevents the errors in the long run relationship from increasing (Engle and Granger, 1987). As such, VECM can be used since we have a cointegrating equation. The VECM is an appropriate estimation procedure which adjusts to both short run changes in variables and deviations from

**Table 3.** VECM Estimation Output.

<b>Coefficient</b>	<b>Std.</b>	<b>Error</b>	<b>t-Statistic</b>	<b>Prob.</b>
ECT	-0.214342	0.05118	-4.187977	0.0005***
LNRGDP(-1)	0.354299	0.139813	2.534089	0.0197***
LNFRD(-1)	-0.055245	0.02137	-2.585153	0.0177***
LNNAR(-1)	0.049408	0.034172	1.445858	0.1637
LNINF(-1)	-0.028917	0.015302	-1.88976	0.0734**
C	0.026437	0.008506	3.107925	0.0055***

\*\*\* and \*\* indicates significance at 5% and 10% respectively; p-value < 0.05 and p-value < 0.10.  
Source: Eviews output.

significant at a 5% level of significance which validated that there is a long run relationship among the variables included in the model. The coefficient of the ECT represents the speed of convergence of the short-run model to the equilibrium. The adjustment coefficient of the ECT informs that the previous year's deviation from long run equilibrium is corrected in the current period at an adjustment speed of approximately 22%.

The VECM estimations revealed the short run dynamics; the individual lagged coefficients for LNRGDP and LNFRD were statistically significant at a 5% significance level while LNINF(-1) was statistically significant at the 10% significance level. LNNAR(-1) was found to be statistically insignificant within the short-run model. To ensure robust and reliable results the Breusch-Godfrey Serial Correlation LM Test was conducted to test for serial correlation, Breusch-Pagan Test and the Jarque-Bera test were employed to check for heteroscedasticity and normality. Using the p-value approach at a 5% level of significance, we failed to reject their null hypotheses, suggesting that the residuals were normally distributed, homoscedastic and not serially correlated.

The significant negative impact of narcotics offences on economic growth in the long-run is consistent with the both a priori expectations and past empirical literature. On the contrary, the money laundering variable, fraud offences, was ascertained at a 5% significance level to have statistically significant positive relationship on long-run economic growth. This finding contradicts the leading hypothesis that money laundering and economic growth are inversely related.

However, in the short-run, the money laundering proxies exhibited the opposite relationship when compared with long-run estimations. Fraud offence was determined as statistically significant and negative within the short-run model validating that there exists a negative relationship between fraud offences and short-run economic growth. On the other hand, the narcotics offences variable was revealed as statistically insignificant within the short-run model. Though, the estimated coefficient observed indicated a positive relationship in the short-run.

Although, a positive relationship was established between economic growth and the money laundering proxies; fraud offences in the long-run model and narcotics (not statistically significant) in the short-run, it must not minimize the destabilizing effects that money laundering causes the overall economy and the importance of reducing its occurrence. Most theories posit that by neglecting to aggressively fight against money laundering more funds are to be made available for scheming individuals to be reinvested in unlawful activities which can lead to a breakdown of the socio-economic environment.

## SUMMARY AND POLICY RECOMMENDATION

The main objective of this study is to evaluate the economic growth- money laundering relationship in Trinidad and Tobago using secondary time series data for the period 1990-2017 using cointegration and ECM techniques. The evidence generated indicates that there is a statistically significant negative impact of narcotics offences on economic growth in the long-run which is consistent with the a priori expectations and past empirical literature. Conversely, fraud offences at a 5% significance threshold, was confirmed as having a statistically significant positive relationship on long-run economic growth. This finding contradicts the leading hypothesis that money laundering and economic growth are inversely related.

In the short-run, the money laundering proxies exhibited the opposite relationship when compared with long-run estimations. Fraud offences were statistically significant and negative, validating an inverse relationship exists between fraud offences and short-run economic growth; while the narcotics offences variable was positive and statistically insignificant within the short-run model.

Although, a positive relationship was established between economic growth and the money laundering proxies; fraud offences in the long-run model and narcotics (not statistically significant) in the short-run, it must not minimize the destabilizing effects that money

laundering causes the overall economy and the importance of reducing its occurrence.

In conclusion, the following results were observed: it was determined that money laundering influences economic growth in Trinidad and Tobago in both the short-run and long-run. The effect of money laundering on economic growth is both positive and negative depending on the proxy and time-span; that is, short-run or long-run.

It is critical that Trinidad and Tobago implements specific policies designed to improve mechanisms used to combat money laundering, thus, minimizing the negative impact on economic growth. Policy decisions and appropriate actions must be consistent with the risks faced by Trinidad and Tobago. Given the empirical results, several areas of improvement were identified.

Trinidad and Tobago should strive towards attaining the status of a fully compliant member of the CFATF by improving its partial compliance and non-compliance ratings in the 40 FATF recommendations. Improvement in the effectiveness level ratings is also necessary as currently all 11 categories received a low or moderate compliance rating.

Archaic money laundering regulations and laws urgently need to be updated within Trinidad and Tobago, especially for the gaming sector and LBs which are high risk. The Gambling (Gaming and Betting) Control Bill 2016 is yet to be enacted in Trinidad and Tobago. Focus also needs to be directed on tackling the predicate offences of money laundering as choosing to combat only money laundering instead of fighting the underlying criminal activity can be ineffective.

It is also necessary that the borders of Trinidad and Tobago are effectively monitored and protected to fight against the illegal drug trade. An enhancement of the enforcement capabilities by ensuring that there is adequate, skilled and well-equipped manpower geared towards reducing the incidence of money laundering either through fighting crime, gathering intelligence and conducting investigations can lead to the fair and timely prosecution of guilty parties.

Continuous money laundering risk assessment of various sectors should be conducted to ensure that the necessary resources are allocated proportionate to the risk posed in each sector. Additionally, this can be used to track whether the level of risk within various sectors of the country are increasing or decreasing. This will give an indicator of the effectiveness of the existing regulatory and legal framework aimed at fighting money laundering.

Continuous empirical research should be completed to examine the evolution of the relationship between money laundering and economic growth. It is important that pragmatic research extends throughout the Caribbean. This, however, is restricted due to the unavailability of data. In most instances, only a short time period of available data can be tested as seen in this study.

Additional areas of research can be completed by

including other money laundering proxies to the model or creating a new model. Additional money laundering proxies which can be incorporated in econometric testing are the annual STR/SAR (sector specific or aggregate) and the CPI. Alternative econometric models can also be used such as panel estimation or GMM to analyse the impact of money laundering on the economy.

## CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

## REFERENCES

- Argentiero A, Bagella M, Busato F (2008). Money Laundering in A Two Sector Model: Using Theory for Measurement. *European Journal of Law and Economics* 26(3):341-359.
- Barone R, Delle SD, Masciandaro D (2017). Drug trafficking, money laundering and the business cycle: Does secular stagnation include crime?. *Metroeconomica* 69(2):409-426.
- Bett A, Muturi W (2016). Does Economic Crimes Affect Kenya's Economic Growth? A Cointegration Approach. *International Journal of Economics, Commerce and Management* 4(11):231-250.
- Central Bank of Trinidad and Tobago (CBTT) (2007). Caribbean Financial Action Task Force AML/CFT Compliance Conference.
- Caribbean Financial Action Task Force (CFATF) (2016). Anti-money laundering and counter-terrorist financing measures; Trinidad and Tobago Mutual Evaluation Report. Accessed June 27, 2018. <https://www.fatfgafi.org/media/fatf/documents/reports/mer-fsrb/cfatf-4mer-trinidad-tobago.pdf>.
- Engle RF, Granger CW (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica: Journal of the Econometric Society* pp. 251-276.
- Financial Action Task Force (FATF) (2019). Improving Global AML/CFT Compliance: On-going Process - 21 June 2019. <http://www.fatfgafi.org/publications/high-risk-and-other-monitored-jurisdictions/documents/fatfcompliance-june-2019.html>.
- Financial Intelligence Unit of Trinidad and Tobago (FIUTT) (2017). Financial Intelligence Unit of Trinidad and Tobago Annual Report 2017. Accessed September 19, 2019. <https://www.fiu.gov.tt/content/FIUTT%20Annual%20Report%202017.pdf>
- Financial Intelligence Unit of Trinidad and Tobago (FIUTT) (2018). Financial Intelligence Unit Overview. Accessed December 4, 2018. <http://www.fiu.gov.tt/>.
- Gray-Farquharson N (2007). The Observed Effects of Money Laundering for Jamaica. Paper presented at the Caribbean Centre for Money and Finance 39th Annual Monetary Conference, Belize City, Belize, November 6 – 9, 2007. CCMS 2007, St. Augustine.
- Hetemi A, Merovci S, Gulhan O (2018). Consequences of Money Laundering on Economic Growth – The Case of Kosovo and its Trade Partners. *Acta Universitatis Danubius. OEconomica* 14(3)113-125.
- Jones P (2015). Evaluating the Effects of Money Laundering on the Economic and Financial Stability of Trinidad and Tobago. Department of Economics, UWI St Augustine.
- Kerrigan D, Sookoo N (2013). White-Collar Crime in Trinidad. Gangs in the Caribbean. Edited by Randy Seepersad, Ann Marie Bissessar, Cambridge Scholars Publishing pp. 150-157
- Maurin A, Sookram S, Watson P (2006). Measuring the Size of the Hidden Economy in Trinidad and Tobago, 1973-1999. *International Economic Journal* 20 (3):321-341.
- Peters A (2017). Estimating the Size of the Informal Economy in Caribbean States. Accessed September 26, 2018. <https://publications.iadb.org/en/estimating-size-informal-economy-caribbeanstates>.

- Seuraj S, Watson P (2012). Banking Regulation: does compliance pay? Evidence from Trinidad and Tobago. *Social and Economic Studies* 61(4):131-144.
- Schneider F, Buehn A, Montenegro C (2010). New Estimates for the Shadow Economies all over the World. Policy Research working paper; no. WPS 5356. Washington,DC: World Bank. Accessed September 27, 2018. <http://documents.worldbank.org/curated/en/311991468037132740/Shadow-economies-all-over-the-world-new-estimates-for-162-countries-from-1999-to-2007>.
- Stancu I, Rece D (2009). The Relationship between Economic Growth and Money Laundering – a Linear Regression Model. *Theoretical and Applied Economics, Asociația Generală a Economistilor din România - AGER* 9(09(538)):3-8.
- Trinidad and Tobago Transparency Institute (TTTI) (2018). Corruption Perceptions Index 2017 shows a high corruption burden in more than two-thirds of countries. Accessed November 5, 2018. <http://transparency.org.tt/2018/02/22/corruption-perceptions-index-2017-shows-high-corruptionburden-two-thirds-countries/>.
- The Gambling (Gaming and Betting) Control Bill (2016). An ACT to provide for the regulation and control of gaming and betting and matters related thereto, Printed by The Government Printer, Caroni Republic Of Trinidad And Tobago, Legal Supplement Part C to the "Trinidad and Tobago Gazette", Volume 55, No. 97. <http://www.ttparliament.org/legislations/b2016h10.pdf>
- United States Department of State; Bureau of International Narcotics and Law Enforcement Affairs (2017). International Narcotics Control Strategy Report. Volume II- Money Laundering. Accessed July 27, 2018. <https://www.state.gov/wp-content/uploads/2019/04/2017-INCSR-Vol-II.pdf>.
- United States Department of State; Bureau of International Narcotics and Law Enforcement Affairs (2018). International Narcotics Control Strategy Report. Volume II- Money Laundering. Accessed August 8, 2018. <https://www.hsdl.org/?abstract&did=809035>.
- Villa E, Misas M, Loayza N (2016). Illicit activity and money laundering from an economic growth perspective: a model and an application to Colombia (English). Policy Research working paper; no. WPS 7578. Washington, D.C.: World Bank Group. Accessed March 2, 2019. <http://documents.worldbank.org/curated/en/696421467996735910/Illicit-activity-and-moneylaundering-from-an-economic-growth-perspective-a-model-and-an-application-to-Colombia>.
- Vuletin GJ (2008). Measuring the Informal Economy in Latin America and the Caribbean. IMF Working Paper WP/08/102. Washington, DC: International Monetary Fund.

**Related Journals:**

