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Does Insurance foster Economic Growth in Sudan?

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Abstract

This paper aims at assessing the role of Insurance in fostering economic growth. Two models of economic growth were estimated via vector error correction mechanism whereas economic growth was a function of average years of educational attainment, unemployment rate, insurance penetration and insurance density, the latter variables appeared once the in each model. Causality test revealed unidirectional relation runs from insurance penetration and insurance density to economic growth indicating supply following. There is a very weak long-run and short-run relationship between economic growth and insurance.

Keywords : Insurance premiums **,**economic growth , demand following.

INTRODUCTION

The relation between insurance development and economic growth has been investigated by many scholars of which are (Olayungbo (2015), Kanywuiro (2015), Phutkaradze (2014), Richterkova & Korab (2013), Carby etal (2012, Philip (2012), Njegomir & Stojić (2010), Hull (2009). Empirical studies assured that insurance sector contributes to economic growth by enhancing financial stability via protecting individuals, and firms from financial losses through risk management; fostering efficient capital allocation; and mobilizing saving. On the other hand, the content of this role in the developmental dimensions refer to the role of these companies in the financial and investment policy implementation through underwriting and pricing activity, compensation and reinsurance, and other events centered on the path of economic activity and development in the economies, particularly those of economy evolution and maturity appropriate to the effective role of insurance activities, conducting business through investing in real projects, and facilitate trade and commerce (Levine 1997, Skipper, 2001, Philip 2011, Central Bank of Sudan 2013).

Insurance industry have come to be known with British colonialism (1898 -1955) in the form of bodies affiliated to foreign commercial agencies to reached 70 before the nationalizing foreign

companies in 1970 then decreased to less than thirty-six. The Sudanese Automobiles Insurance Company Ltd (Khartoum Insurance Company) established by Lorries owners in 1951 for compulsory insurance, was the first insurance company (Siddig 2011). The Sudanese insurance market was linked to the global market for several reasons: tight capacity of the national companies and small size of their capital to meet high value insurance prompts, limited power of national reinsurance company, the weakness and lack of experience in the fields of evaluation and assessment of losses and compensation (Osman 2004). Sudanese Insurance companies aim to protect individuals from financial losses arising from and not related to the insured. Insurance includes the properties, marine, aviation, energy, cars, in addition to medical insurance and engineering besides insuring miscellaneous accidents and other types of insurance. The number of companies operating in the field of insurance and reinsurance in 2013 were 15 of which 14 insurance companies and one company in the area of reinsurance. The insurance companies provide insurance services and invest resources in certificates and investment deposits, besides conducting business in the fields of real estate and other areas. Sheikan insurance company is the largest one constitutes about 54 per cent of Sudanese insurance market, followed by Islamic insurance company of 10 per cent and Juba insurance company 7 percent the other 12 companies has 29 per cent. Shares of insurance companies listed in Khartoum Stock Exchange Market increased from 0.02 per cent in 2002 to 1.2 per cent of total shares in 2013 (Bank of Sudan 2002, 2013).

The motivation for this paper is paucity of Sudanese empirical studies on the relationship between insurance and economic growth, to my knowledge (Elhassan 1981, Mohamed 1987, Nyawello 2003, Osman 2004, Siddig 2011, Triq 2014, and Munjid 2015) employed historical methodology, descriptive, inference, and time series analysis, while this paper used dynamic analysis tools i.e. Granger causality, cointegration analysis and error correction mechanism to investigate this relationship. This paper differs from others in the selection of the model variables i.e. density insurance instead of insurance penetration, unemployment, and educational attainment due to their effects on economic growth.

This paper is structured as follows; literature review presented in section two, theoretical background in section three, followed methodology in section four, empirical results and discussion in section 5, and finally the conclusion.

2. Literature Review

The first conference of UNCTAD (1964) recognized the importance of insurance in trade and development (Kugler and Ofoghi 2005), sine then the issue has been studied extensively in the developed world up to Kugler, and Ofogh, (2005) revealing no effect of insurance on the UK economic activity; EGE and Bahadır (2011) testing the role of insurance in changing economic growth using data of twenty-nine advanced countries from 1999 to 2008, finding positive relationship and Wanat etal (2016) using bootstrap panel causality approach for data from ten transition European Union member countries in the period between 1993 and 2013.

Many scholars from developing countries have investigated this relation of which KILO (2015) for 30 Sub-Saharan countries over the period 1995-2011 finding bidirectional between GDP and insurance.; Olayungbo (2015) for South Africa in the period of 1970 to 2012 proved unidirectional causalities running from insurance activities and financial development to economic growth, and in the short run, financial development promotes insurance demand a result from Vector Error Correction Model (VECM); Kanywuiro (2015) assessed the development of life insurance in Kenya in relation to economic growth establishing the direction of causality for panel data covering Kenya, Uganda, and Tanzania, over the period 1999-2013. He found significant relationship between life insurance penetration and economic growth via Generalized Least Squares; Phutkaradze (2014) for former transition countries showed a negative and statistically non-significant correlation between insurance and GDP growth, suggesting a lack of evidence that insurance promotes economic growth in post-transition economies employing multiple regression analysis and fixed effects, over the period 2000–2012; Richterkova & Korab (2013) confirmed positive effect of insurance activity on economic growth using meta-analysis of 10 published and unpublished studies,; Yinusa, and Akinlo (2013) and Ogunyiola Ayorinde (2013), Carbyetal (2012), and Simwaka *etal* (2012) found long run relationship between insurance development and economic growth in Nigeria over the period 1986 to 2010 and 1980 2011, 1946 2011, 1980 2010 via VECM for Nigeria, Cape Verde, Barbados, and Malawi respectively whereas Carby etal (2012) couldn't find support for this thesis; Ojo (2012) and Philip (2011) adopted fixed-effect model and causality test , and VECM within the period of 1985 and 2009, and 1970 2008 of the Nigerian economy respectively to find that insurance sector growth and development positively and significantly affects economic growth; Njegomir & Stojić (2010) and Aseel (2009) got similar results in ex-Yugoslavia region applying country-specific fixed effects models for panel data for the period 2004-2008 and Palestine respectively.

Few Sudanese empirical studies have dealt with insurance-economic growth relationship i.e. Elhassan (1981) studied the regulations in Tanzania and Sudan to find that direct model of insurance control in Tanzania is more appropriate to the needs of underdeveloped countries than a regulatory model of the Sudanese type. This conclusion conforms to insurance theory. Mohamed (1987) investigated the theoretical and empirical insurance status represented by Islamic Insurance Company Ltd as a pioneer applying cooperative insurance and expanded in the field of reinsurance. His main finding are Insurance contract is held on Islamic jurisprudence, commences with donation and ends with compensation, Islamic cooperative companies were successful, efficient, distribute surplus without discrimination and the insurance activity booms with economic recovery and stability and its decay with recession and inflation and instability; Nyawello (2003) assessed the growth of the gross insurance premium (GIP) in the Sudan in the period 1970-2000, and the implication of that growth pattern for planning the financial sector for development in the future. His result shows that the Sudanese insurance industry was yet at a rudimentary stage on account of the persistence of small but declining relative GIP, the manifestation of extreme rigidity, and the absence of agricultural insurance. Osman (2004) described and assessed the experience of the insurance sector Sudan shifting from traditional system (RIBA) to cooperative mutual insurance system (Islamic) which was early 1992. Siddig

(2011) investigated the insurance industry in Sudan motivated by the role of insurance as economic activity in socio-economic development, and the little interest by economists and specialists on this activity. He employed historical methodology and descriptive analysis revealing that insurance companies invest in saving funds of banks, post office, government bonds, and real estate. Tarig (2014) was concerned with the role of insurance protection of banks against risk using descriptive and historical approach and analytical method. He found weak insurance awareness among employees of the Sudanese banking system, insurance protects banks from certain risks, and coverage provided by insurance companies are not sufficient to cover the risks. Munjid (2015) study on the economic impact of the insurance who found that imported services, insurance services and insurance companies do not play their role as institutions contribute to the economic development, but act as an intermediary for international companies where they collect premiums and then returned, thus the impact of insurance on the economy following the very weak, almost doesn't exist

3. Theoretical Background

The economic importance of insurance for individual and public interest varies according to its different kinds and its elements. It gives reassurance to national investment and maintaining economic growth. This importance has increased recently after international trade liberalization in the service sector, and the completion of the third side of economic globalization (financial, monetary, commercial), through the General Convention on trade in Services GATS (Tariq 2010). Insurance theories postulate that insurance result from need for protection and security; guarantee for economic and financial status; repair of possible damage; compensation in the event of danger; process of collaboration between the insured that face similar risks the insured are the ones who guarantee covering the risks for themselves. Besides the individual interest insurance takes into account the public interest, it strengthens the national economy and become a production factor to maintain other means of production. Insurance industry collects the premiums to employed in multiple images (stocks, bonds, real estate.), and thus contributes to the financing of economic projects which results in raising the standard of living of individuals, and therefore social sustainability. It creates room for commercial and financial transactions with the outside world (payments, capital movements, compensation...), bringing hard currency and vice versa, reinsurance premiums under agreements with insurance companies abroad and as well as running a portfolio of financial assets for insurance companies. Insurance and insurance plays an important role: inflation limit of creating inflationary pressures caused by increasing the amount of money-demand lock request inevitably leads to reserve funds that were spent (Zaroogi and Badry 2012).

Education raises the human capacity to increase production and achieve high rates of economic growth. However, high economic growth rate is determined by the nature of economic policy adopted, where Keynesian analysis focuses on the recovery policy through demand and prevailing belief of most economists, is that unemployment will drop automatically if the economy grew, while the focus of more liberal on the supply side by supporting profitability and cost of projects (Abdalla and Ahmed 2004).

There is significant correlation observed between growth and changing unemployment rates, high growth rates indicate a need for additional manpower to the economy to be employed from all labour market surpluses in the previous periods. And in return, the recession which usually corresponds to low or negative growth rates increases unemployment by loss of jobs. While the sluggish economy reduces creation of new job positions below the normal level of unemployment should begin to fall. Okun's law links between real income and the effect of growth on levels of employment, that is low income means lower production and lay off the workforce and thus a number of the unemployed or the so-called economic wastage of human resources The inverse relationship between the rate of change in the growth rate of GDP and the change of the rate of unemployment in Okun's law was found to fit Sudanese economy (Mukhtari 2004). Growth in one sector of the economy will not automatically translate into benefits for the poor: much will depend on the profile of growth (its employment - or productivity - intensity), the sectoral location of the poor, and the extent of mobility across sectors. For employment-intensive growth to translate into poverty reduction it must occur in a "more productive" sector, while "less productive" sectors may require productivity-intensive growth to ensure a decline in headcount poverty Hull (2009).

4. Methodology

4.1 Data Description

The sample covers the period 1987-2014. The model comprises four constructed variables. Per capita income was constructed by dividing real gross domestic product by total population; insurance density is constructed as the ratio of premium underwritten in a given year to the total population. Unemployment rate, and average years of educational attainment were interpolated to construct a continuous series. Unemployment rate is the ratio of population looking for jobs to the labor force. Years of educational attainment is the years of formal schooling received, on average, by adults over age 15.

Table (1) Data Description

Variable	Symbol	Source
Per GDP (Economic Growth)	Q	Central Bureau of statistics
Insurance Penetration	PEN	Bank of Sudan/CBS
Insurance Density	Density	Bank of Sudan/CBS
Unemployment Rate	U	Central Bureau of statistics
Years of educational attainment	SCH1	Barrow-Lee tables

4.2 The Model

Two models were estimated via vector error correction mechanism. The first one considers real GDP growth proxied by per capita income as the dependent variable to be a function of average year of educational attainment, unemployment, and insurance per capita (density). The intuition behind including the explanatory variable is that: growth of education increases knowledge and information, and is reflected by the improved production. There is a broad consensus that

not all growth spells have the same impact on poverty (Hull 2009). Economic growth can be supply-led through the growth of financial institution, or inversely financial institution can be demand-led through the growth of the economy (Patrick 1966). Cristeaa etal (2013) identified the channels through which insurance industry promotes economic growth that is protection of firms enhancing financial stability; encouragement of investment and innovation; offering protection in joint participation with the state; relieving pressure on the state with regard to covering large damages; Increasing financial intermediation, creation of liquidity and savings; and promotion of risk prevention.

The following model specify economic growth proxied by per capita income as a dependent variable to explained by lagged dependent variable, average years of educational attainment, density that proxies insurance, and unemployment in the framework of error correction mechanism.

$$\Delta Q_t = \alpha_0 + \sum_{j=1}^{n} \alpha_{1i}\, \Delta(Q)_{t-i} + \sum_{i=1}^{n} \alpha_{2i}\Delta(SCH)_{t-i} + \sum_{i=1}^{n} \alpha_{2i}\Delta(U)_{t-i} + \sum_{i=1}^{n} \alpha_{2i}\Delta(Density)_{t-i} + \lambda(EC)_{t-i}$$

The second model considers per capita income as function of insurance penetration average years of educational attainment, and unemployment rate.

$$\Delta Q_t = \alpha_0 + \sum_{j=1}^{n} \alpha_{1i}\, \Delta(Q)_{t-i} + \sum_{i=1}^{n} \alpha_{2i}\Delta(SCH)_{t-i} + \sum_{i=1}^{n} \alpha_{2i}\Delta(U)_{t-i} + \sum_{i=1}^{n} \alpha_{2i}\Delta(PEN)_{t-i} + \lambda(EC)_{t-i}$$

5- Results and Discussion

5.1 Results

Annex (1) shows that the insurance penetration has the lowest variation followed economic growth, average years of schooling, and employment rate respectively, while insurance density varies largely. Jarque-Bera statistic is significant for insurance penetration and density indicating the rejection of the null of whether the series is normally distributed.

Table (2) Unit Root Test (exogenous none)

Variable	Level	First Difference	2nd Difference	Order
DENSITY	5.230847(PP)	-2.960391**(PP)		I(1)
Penetration	-0.36885	-4.87399***		I(1)
SCH1	0.501883	0.010840**		I(1)
Q	3.764276	-1.1993010**		I(1)
U	1.976699	1.1588805	-3.781795***	I(2)

*(**)(***) indicates rejection of null hypothesis of unit root; (PP) Phillips-Perron

Cointegration test indicated that model (1) has 2 cointegrating equations at 5 per cent level while model (2) has 3 cointegrating equations. Since there is cointegrating equations at 0.05 levels, Vector Error Correction Model (VECM) would be an appropriate choice. Endogenous

variables are economic growth, insurance density, penetration, average years of educational attainment, and unemployment rate.

Results from causality test indicated unidirectional Granger causality runs from insurance density, penetration, and average years of schooling to economic growth; from density to unemployment, average years of educational attainment to unemployment. There is bidirectional between unemployment and density, unemployment and penetration.

Table (3) Summary of Estimation Results

Model	Model (1)		Model (2)	
Endogenous Variables	Short-run	Long-run	Short-run	Long-run
Q(-1)		1.0000		1.000
DENSITY(-1)		0.000014***		
PENETRATION (-1)				847.3881***
SCH1(-1)		0.316336***		0.191454***
U(-1)		-0.25285***		-0.17241***
Constant		2. 62222***		1.909105***
ΔQ	-0.51277**		-0.40916**	
Δ DENSITY	0.0000084			
ΔPEN			-90.4368	
ΔSCH1	0.21356***		0.675842***	
ΔU	-0.03924**		-0.03614**	
Error Correction		-0.12034***		-0.17586**
R^2		0.55		0.46
$\bar{R}^2$		0.45		0.33
Akaike AIC		-4. 04828		-3.86362

*(**)(***) indicates rejection of null hypothesis that estimated parameters equal zero

The estimated long-run parameters of both models obtained the correct signs, and are significantly different from zero; the short-run estimates of density and unemployment are significant and got the right sign, educational attainment, and lagged economic growth despite their significance got the wrong signs. Model (1) outweighs model (2) with respect to explanatory power, and information criterion.

5.2 Discussion

The insurance sector in Sudan is divided into two sub-sectors, social insurance, and commercial (general) insurance. The economic feasibility of the agreed insurance payments on life insurance contracts in the social insurance has been affected by increased inflation, which lowers the desire to deal with insurance companies to benefit from social insurance service. Commercial insurance includes all types of insurance: marine, aviation, automobile, fire, engineering, agricultural animal production, miscellaneous, and poultry. Insurance industry was subjected to 1960 law despite the application of Islamic laws since 1983, and then in 1990 the situation has

been changed whereas the whole financial sector was subjected to Islamic laws. This application affected the Insurance positively. The share of listed Insurance companies in Khartoum Stock Exchange increased from 0.2 to 1.2 per cent in 2013. Another benefit was the establishment of Islamic insurance companies. Faisal Islamic Bank was the pioneer in establishing Islamic Insurance Company in 1978 with zero- interest loan according to Islamic cooperative insurance system to insure his properties in accordance with Islamic basis. It was established in accordance with Sudanese companies' act of 1925 as a limited company with two accounts, one for capital investment and independent one to save and invest money (premiums) insurance. The establishment of the company had a significant impact on the shift towards Islamic cooperative insurance system in Sudan and other countries where most Islamic banks established affiliated insurance companies. The experience was adopted by other Islamic banks to include long term Takaful (tontine) on Islamic basis, the idea became mandatory by law and order in Sudan. Takaful has the largest share about 88 per cent followed by marine 5 per cent and automobile 4 per cent.

Islamic insurance company has surplus distributed to policyholders. This excess can either mean that compensation was less than the premiums or that each loss compensation equal premiums but the company achieved surpluses from investment. In order to encourage and develop export National agency for Insurance and Finance of Exports was established in 2005 with paid capital SDG 55 contributed 77 per cent by the Central Bank of Sudan, 19 per cent by the Ministry of Finance, and4 per cent by 11 banks.

Insurance density has a very small effect on economic growth i.e. 1 per cent increase in density raises economic growth by 0.0000014 per cent. this due to the small size of the insurance sector; the available products of insurance; low level of income since the official figures reveal that 46 per cent are under the poverty line, the low level of educational attainment; lack of the geographical distributions; and growing unemployment. This result conforms to findings of Nyawello (2003) Munjid (2015).

6. Conclusion

This paper investigated the relationship between insurance and economic growth in Sudan over the period 1989 – 2009. The selection of this period was due to data availability. Granger causality revealed unidirectional runs from economic growth to the insurance density; from average years of educational attainment to economic growth; from unemployment to economic growth, from unemployment to average years of educational attainment and one bidirectional causality between unemployment and insurance density. Two models, the first one related economic growth proxied by per capita income to unemployment in an inverse relationship as postulated by Okun's law, insurance density i.e. insurance premium per individual and average years of educational attainment. The second model interchanged insurance density by insurance penetration. The main hypothesis that insurance industry affects economic positively has been proved but the effect was found to be very weak.**6.**

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Annex

Annex (1) Summary Statistics

	Q	DENSITY	SCH1	U	PEN
Mean	0.473597	13393.07	2.807545	16.31545	6.03E-05
Median	0.433837	3032.49	2.874	16.015	3.82E-05
Maximum	0.700856	185140.9	3.485	20.7	0.000482
Minimum	0.314196	7.988747	1.941	14.02	1.71E-05
Std. Dev.	0.108457	38767.91	0.481268	1.852524	9.55E-05
Skewness	0.406189	4.217272	-0.28932	0.77398	4.173207
Kurtosis	1.946699	19.22251	1.846153	2.881429	18.974
Jarque-Bera	1.621951	306.452	1.527336	2.209388	297.762
Probability	0.444424	0.00000	0.465954	0.331312	0.00000

Annex (2) Cointegration Test for Penetration

Date: 07/02/16 Time: 08:05				
Sample (adjusted): 1989 2010				
Included observations: 22 after adjustments				
Trend assumption: No deterministic trend (restricted constant)				
Series: Q PEN SCH1 U				
Lags interval (in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.988243	151.4304	54.07904	0
At most 1 *	0.791769	53.67698	35.19275	0.0002
At most 2	0.450569	19.1566	20.26184	0.0704
At most 3	0.238057	5.981431	9.164546	0.1921
Trace test indicates 2 cointegrating equations at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Annex (3) Johansson - Julius Cointegration Test: Density

Dependent Variable: INSURANCE/POP				
Method: Least Squares				
Date: 06/25/16 Time: 02:33				
Sample: 1989 2009				
Included observations: 21				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Q	383.8096	93.01485	4.126325	0.0007
SCH1	-43.7498	19.4666	-2.24743	0.0382

U	21.19403	4.503233	4.706403	0.0002
C	-349.11	36.20902	-9.64152	0.0000
R-squared	0.954969	Mean dependent var		51.22998
Adjusted R-squared	0.947022	S.D. dependent var		57.93865
S.E. of regression	13.33569	Akaike info criterion		8.188408
Sum squared resid	3023.29	Schwarz criterion		8.387364
Log likelihood	-81.9783	Hannan-Quinn criterion		8.231587
F-statistic	120.1721	Durbin-Watson stat		1.99407
Prob(F-statistic)	0.00000			

Table (4) Pairwise Granger Causality Tests Penetration

Pairwise Granger Causality Tests			
Date: 07/02/16 Time: 08:10			
Sample: 1989 2014			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
PEN does not Granger Cause Q	25	3.68666	0.0434
Q does not Granger Cause PEN		1.34106	0.2841
SCH1 does not Granger Cause Q	22	5.95056	0.011
Q does not Granger Cause SCH1		0.8911	0.4285
U does not Granger Cause Q	25	3.19407	6.25E-02
Q does not Granger Cause U		5.90611	0.0096
SCH1 does not Granger Cause PEN	22	1.05699	0.3693
PEN does not Granger Cause SCH1		1.10226	0.3547
U does not Granger Cause PEN	25	10.2079	0.0009
PEN does not Granger Cause U		4.52245	0.024
U does not Granger Cause SCH1	22	0.06272	0.9394
SCH1 does not Granger Cause U		6.81556	0.0067

Table (5) Pairwise Granger Causality Tests Density

Date: 07/02/16 Time: 08:13			
Sample: 1989 2014			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
DENSITY does not Granger Cause Q	25	3.5969	0.0463
Q does not Granger Cause DENSITY		1.2449	0.3093
SCH1 does not Granger Cause Q	22	5.95056	0.011

Q does not Granger Cause SCH1		0.8911	0.4285
U does not Granger Cause Q	25	3.19407	0.0625
Q does not Granger Cause U		5.90611	0.0096
SCH1 does not Granger Cause DENSITY	22	0.4107	0.6696
DENSITY does not Granger Cause SCH1		2.53307	0.1089
U does not Granger Cause DENSITY	25	10.3232	0.0008
DENSITY does not Granger Cause U		4.98119	0.0176
U does not Granger Cause SCH1	22	0.06272	0.9394
SCH1 does not Granger Cause U		6.81556	0.0067

Annex (6) Vector Error Correction Estimates Model (1)

Vector Error Correction Estimates				
Date: 07/02/16 Time: 17:58				
Sample (adjusted): 1989 2010				
Included observations: 22 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
Q(-1)	1			
DENSITY(-1)	1.40E-05			
	-2.90E-06			
	[4.79928]			
SCH1(-1)	0.316336			
	-0.02545			
	[12.4314]			
U(-1)	-0.25285			
	-0.01217			
	[-20.7687]			
C	2.622215			
	-0.18189			
	[14.4166]			
Error Correction:	D(Q)	D(DENSITY)	D(SCH1)	D(U)

CointEq1	-0.12034	-219614	-0.00012	3.589677
	-0.04199	-6368.56	-0.00821	-0.70245
	[-2.86617]	[-34.4840]	[-0.01468]	[5.11020]
D(Q(-1))	-0.51277	100121.3	0.007981	-2.24248
	-0.18434	-27960.7	-0.03605	-3.08407
	[-2.78162]	[3.58078]	[0.22135]	[-0.72712]
D(DENSITY(-1))	8.49E-06	-3.60645	1.80E-07	0.000455
	-7.50E-06	-1.14167	-1.50E-06	-0.00013
	[1.12853]	[-3.15893]	[0.12240]	[3.61263]
D(SCH1(-1))	0.213564	198988.5	0.968258	-1.61476
	-0.10237	-15527.8	-0.02002	-1.71272
	[2.08616]	[12.8150]	[48.3588]	[-0.94280]
D(U(-1))	-0.03924	-66502.3	0.000132	0.745971
	-0.01406	-2132.89	-0.00275	-0.23526
	[-2.79039]	[-31.1794]	[0.04800]	[3.17086]
R-squared	0.551724	0.987798	0.917482	0.647946
Adj. R-squared	0.446247	0.984926	0.898066	0.56511
Sum sq. resids	0.014269	3.28E+08	0.000546	3.993962
S.E. equation	0.028972	4394.42	0.005666	0.484705
F-statistic	5.23076	344.0395	47.25391	7.82202
Log likelihood	49.53112	-212.919	85.42989	-12.4478
Akaike AIC	-4.04828	19.81078	-7.31181	1.586164
Schwarz SC	-3.80032	20.05874	-7.06384	1.834128
Mean dependent	0.013689	8415.124	0.074682	0.185
S.D. dependent	0.038933	35792.51	0.017748	0.735001
Determinant resid covariance (dof adj.)		0.041586		
Determinant resid covariance		0.014827		
Log likelihood		-78.5423		
Akaike information criterion		9.412938		
Schwarz criterion		10.65276		

Annex (7) Vector Error Correction Estimates of Model (2)

Vector Error Correction Estimates
Date: 07/02/16 Time: 17:58
Sample (adjusted): 1989 2010
Included observations: 22 after adjustments

Standard errors in ( ) & t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
Q(-1)	1			
DENSITY(-1)	1.40E-05			
	-2.90E-06			
	[4.79928]			
SCH1(-1)	0.316336			
	-0.02545			
	[12.4314]			
U(-1)	-0.25285			
	-0.01217			
	[-20.7687]			
C	2.622215			
	-0.18189			
	[14.4166]			
Error Correction:	D(Q)	D(DENSITY)	D(SCH1)	D(U)
CointEq1	-0.12034	-219614	-0.00012	3.589677
	-0.04199	-6368.56	-0.00821	-0.70245
	[-2.86617]	[-34.4840]	[-0.01468]	[5.11020]
D(Q(-1))	-0.51277	100121.3	0.007981	-2.24248
	-0.18434	-27960.7	-0.03605	-3.08407
	[-2.78162]	[3.58078]	[0.22135]	[-0.72712]
D(DENSITY(-1))	8.49E-06	-3.60645	1.80E-07	0.000455
	-7.50E-06	-1.14167	-1.50E-06	-0.00013
	[1.12853]	[-3.15893]	[0.12240]	[3.61263]
D(SCH1(-1))	0.213564	198988.5	0.968258	-1.61476
	-0.10237	-15527.8	-0.02002	-1.71272
	[2.08616]	[12.8150]	[48.3588]	[-0.94280]
D(U(-1))	-0.03924	-66502.3	0.000132	0.745971
	-0.01406	-2132.89	-0.00275	-0.23526
	[-2.79039]	[-31.1794]	[0.04800]	[3.17086]
R-squared	0.551724	0.987798	0.917482	0.647946
Adj. R-squared	0.446247	0.984926	0.898066	0.56511
Sum sq. residuals	0.014269	3.28E+08	0.000546	3.993962
S.E. equation	0.028972	4394.42	0.005666	0.484705
F-statistic	5.23076	344.0395	47.25391	7.82202
Log likelihood	49.53112	-212.919	85.42989	-12.4478
Akaike AIC	-4.04828	19.81078	-7.31181	1.586164
Schwarz SC	-3.80032	20.05874	-7.06384	1.834128
Mean dependent	0.013689	8415.124	0.074682	0.185
S.D. dependent	0.038933	35792.51	0.017748	0.735001

Determinant resid covariance (dof adj.)	0.041586		
Determinant resid covariance	0.014827		
Log likelihood	-78.5423		
Akaike information criterion	9.412938		
Schwarz criterion	10.65276		

Vector Error Correction Estimates				
Date: 07/02/16 Time: 07:41				
Sample (adjusted): 1989 2010				
Included observations: 22 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
Cointegrating Eq:	CointEq1			
Q(-1)	1			
PEN(-1)	847.3881			
	-225.908			
	[3.75102]			
SCH1(-1)	0.191454			
	-0.02058			
	[9.30358]			
U(-1)	-0.17241			
	-0.00516			
	[-33.4399]			
C	1.909105			
	-0.1324			
	[14.4189]			
Error Correction:	D(Q)	D(PEN)	D(SCH1)	D(U)
CointEq1	-0.17586	-0.00081	-0.00063	4.202981
	-0.06354	-2.80E-05	-0.01096	-1.25083
	[-2.76786]	[-29.2117]	[-0.05753]	[3.36016]
D(Q(-1))	-0.40916	0.000563	0.010123	-0.29586
	-0.19672	-8.60E-05	-0.03393	-3.87277
	[-2.07986]	[6.55018]	[0.29833]	[-0.07639]
D(PEN(-1))	-90.4368	0.610259	87.89153	503.952
	-467.653	-0.20421	-80.6674	-9206.38
	[-0.19338]	[2.98841]	[1.08955]	[0.05474]
D(SCH1(-1))	0.675842	0.002319	0.971153	-8.51258
	-0.18355	-8.00E-05	-0.03166	-3.61351

	[3.68198]	[28.9360]	[30.6725]	[-2.35576]
D(U(-1))	-0.03614	-0.00017	0.000113	0.648972
	-0.01502	-6.60E-06	-0.00259	-0.29577
	[-2.40511]	[-25.1938]	[0.04349]	[2.19418]
R-squared	0.46081	0.982209	0.922799	0.413692
Adj. R-squared	0.333941	0.978023	0.904634	0.275737
Sum sq. resids	0.017163	3.27E-09	0.000511	6.651523
S.E. equation	0.031774	1.39E-05	0.005481	0.625513
F-statistic	3.632188	2.35E+02	50.80088	2.998744
Log likelihood	47.49987	2.18E+02	86.16249	-18.0585
Akaike AIC	-3.86362	-19.3363	-7.37841	2.096226
Schwarz SC	-3.61566	1.91E+01	-7.13044	2.34419
Mean dependent	0.013689	2.04E-05	0.074682	0.185
S.D. dependent	0.038933	9.36E-05	0.017748	0.735001
Determinant resid covariance (dof adj.)		1.19E-18		
Determinant resid covariance		4.23E-19		
Log likelihood		340.5037		
Akaike information criterion		-28.6822		
Schwarz criterion		-27.4423		