Determinants of International Reserves Among Organisation of Petroleum Exporting Countries (OPEC)

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Abstract

Member countries of the Organisation of Petroleum Exporting Countries (OPEC) are always in the news regarding the prices and supply of crude oil to the international market. One of the economic reasons for this is liquidity and the desire to accumulate international reserves by the respective countries. This paper examined the determinants of international reserves among the cartel against the backdrop of the motives for keeping reserves. With data from 2005 to 2018, the adopted variables that were tested with the system of generalised methods of moments (Sy-GMM) are inflation, exchange rates, oil prices, crude oil dependence, economic crises and others. The results and outputs show that inflation was negatively impactful externally and internally, while FDI inflows recorded negative significance. Economic crises and economic openness were positively significant, while oil prices and exchange rates were not significant determinants of international reserves accumulation. The paper recommends the maximisation of opportunities available by members during

economic crises to accumulate reserves that will enable them to diversify from dependence on crude oil exports to include other products and a higher level of openness to open the economy up for competition to make the economies stronger.

Introduction

The role that international reserves have assumed in most countries has been taken to new heights. Countries can accumulate reserves when they have a good terms of trade (ToT) position to do so, and the trade balance is favourable. Included among these are the Organisation of Petroleum Exporting Countries (OPEC) countries, which produce crude oil for sale in the international market, with their commodity having an inelastic demand. These countries are mainly developing and require capital for consumption in various amounts over the years that would help develop their countries. Central banks (CB) attempt to keep reserves to support international transactions for their economies, and international reserves act as a buffer for their economies and support their currency. Essentially, it should control possible exchange rate volatility. These reasons have always led to the accumulation and hoarding of international reserves (IR). Since medieval times, when gold and other precious metals were traditional media of exchange, IRs helped grant purchasing power to countries for transactionary purposes across countries. Commonly used to stave off shocks and volatilities in domestic currency, countries have developed a herd instinct to continuously accumulate international reserves that can back up the domestic currency and help meet other domestic developmental objectives. Recent experiences and studies indicate that emerging economy countries tend to accumulate higher reserves to meet shocks from imbalances in the Balance of Payments: varying balances from current to capital accounts over the last twenty years (Gosh, Ostry, and Tsangarides 2014). The study also agreed that this is the case for most emerging economies., especially the RIMs (Malaysia, China, Korea, etc.). Keeping a high level of reserves was intended to help align the exchange rate (ER) in many countries.

Countries have different models for accumulating and managing their IR. Most common among these is the import coverage period that most developed countries use. The most popular is the Guidotti-Greenspan Rule (Jeanne and Rancière 2006) for the one-year cover of short-term foreign capital outflows. However, OPEC countries (most are developing) have a differing purpose for stocking IR, amongst which is the buffer it serves for the economy when in distress. Steiner (2017) gave three clears reasons for the interest in the accumulation of reserves: 1) for precautionary purposes to support mercantilist ideals and mitigate output volatility (Aizenman and Ito 2012); 2) to support under-

valued exchange rates to encourage and promote exports by keeping ERs down; 3) as a strategy by most developing countries where the financial markets are underdeveloped. The central bank (CB) acts as a financial intermediary (Shin and Turner 2015) as a lender of last resort.

Accumulating reserves is not without risks and costs. Steiner (2017) acknowledged the role of IRs as a causal determinant of global inflation. For OPEC members, the accumulation of reserves seems spurred by the export of a seemingly inelastic commodity whose price, when threatened, throws members into an economic quagmire and macroeconomic instability. As a result of the developing nature of most cartel members, the need to acquire and maintain large IRs becomes essential and paramount. There is no doubt that the IR has stood these countries in good stead for their development, and as such, many of the 14 countries can be grouped as part of the emerging market economes.

OPEC members frequently need to diversify their economies, which requires resources and thus public expenditure (Alberola, Erce, and Serena 2016). The public expenditure required would need to be sterilised to control inflation. Interestingly, some OPEC members are in the throes of high inflation and low IR, having managed this resource sub-optimally. A few have diversified fundamentally. Earnings from oil form an insignificant amount of the IR accumulation, which is why the hoarders of the largest reserves are non-OPEC members. Trading crude oil requires many bilateral parities, whose openness has been rendered insignificant among trading countries. Globalisation has forced countries to open up to capital flows and other resources that their various economies may need. Lane and Milesi-Ferretti (2007) identified trade and financial openness as significant components of movements across countries in the 2010s. Saudi Arabia, arguably the largest exporter of crude oil, occupies the tenth position among the countries with the highest level of reserves globally and is first among the cartel.

With the understanding that large IRs encourage inflows of capital and, subsequently, foreign exchange into the respective countries, accumulation by OPEC should encourage a greater amount of IR in the respective countries' composite development. The paper objectifies the determinants for the accumulation of IRs by OPEC members and essentially investigates the nature of what encourages this accumulation. Following this section is a brief, relevant literature review, followed by the methodology, results from output and discussions. The final section concludes and provides recommendations.

Literature review

Conceptually, IR is a country's stock of financial resources outside its shores invested to support the domestic economy (International Monetary Fund 2009). It is variously defined as external or foreign reserves, though the popular term in the literature is in-

ternational reserves. Technical terms for IRs are international media of exchange, international liquidity and vehicle currencies (Moosa 1992). Commonly held in strong negotiable foreign currencies, liquid financial instruments and gold by the central bank (CB) of the respective country, it is used for various reasons as desired by the CB and the monetary authority as enabled by law.

Asset composition of reserves is defined by the country of interest, where the first issue is what drives the choice of currency (Aizenman, Cheung, and Qian 2019). The study identified four currencies held for reserves before the global financial crisis (GFC) of 2007: the United States Dollar, the Euro, the Yen and the Great British Pound. The GFC changed this behaviour somehow as the GFC and quantitative easing (QE) were factors that subsequently determined the holdings of various currencies as reserves. Commodity exporting countries (like OPEC) tend to diversify their holdings from the big four when their terms of trade improve.

At the same time, the valuation of the effects of the parity between USD/Euro diminished the importance of the GFC as a determinant of the currency composition of IRs. While commodities determined the choice of currency before the GFC, monetary issues became paramount after that.

Explicitly, the reserves serve various purposes, depending on the objectives set by the monetary authority or the country's government. Moosa (1992) believes IR is money at the international level, and attached three Keynesian demands for money: 1) speculative – the opportunity cost of holding reserves; 2) precautionary – to deal with Balance of Payment (BoP) imbalances or support the domestic currency in the foreign exchange market; 3) transactionary – which depend on imports as a variable. The various uses are explained by studies such as Lawrence (2006) for insurance against volatilities in currency and shocks in ER fluctuations, especially when the domestic currency is overvalued. Dooley, Folkerts-Landau, and Garber (2004) found that IRs support monetary policy and act as a buffer against excessive capital outflows. The European Central Bank (2006; 2012) believed it is mainly used for insurance against currency crises and an overvalued domestic currency, while the International Relations Committee Task Force (2006) believes that stocking up reserves allows for an increase in the country's purchasing power.

In all the primary uses and objectives of keeping IR, the support for the domestic economy is dominant. Therefore, reserves matter (Fischer 2001). One of the fundamental reasons for accumulating, stocking or hoarding IR was the need not to have a repeat experience of the contagion of the 1990s, especially from the Asia region (Reddy 2006; Aizenman 2008). The specific case study was the Asian crisis. The global financial crises of 2007–2010 indicated that many countries strengthened their IR positions to stabilise their economies, especially Poland. Čech and Jevčák (2011) reported that

most countries of Central and Eastern Europe (CEE) performed well with the metrics to measure the adequacy of the IRs, even when a vulnerable metric was adopted.

Emerging economies are at the forefront of IR accumulation, and most are in the Asia region. This is probably attributed to the need to be self-insured against the contagion of the late 1990s, when some were severely hit. Lawrence (2006) and Irefin and Yaaba (2011) state that protecting the domestic economy is significant in IR accumulation in Asian countries. The OPEC members also accumulated IR in their various capacities. Other countries that have accumulated reserves include China, Japan, and South Korea, although they are non-OPEC members. Specifically, countries that do not require such huge level of reserves have found the need to maintain large quantities, which was attributed to structural breaks in the model adopted (Lee and Luk 2018).

IR management theories have been formalised since the 1960s but became germane for economic management in the 1980s following sudden stops of capital inflows into developing countries. Jeanne and Rancière (2006) documented the different models in place, and more nomenclature is explained by Irefin and Yaaba (2011). The Buffer model of Frenkel and Jovanovic (1981) has endured, having been tested across many studies and found stable The proposal of the International Monetary Fund (2009) for IRs to meet three to four months of imports imbalances (not net current account transactions) led to the maintenance of 5% to 20% of the M2 (Marion 2005). Pineau et al. (2006) argued that countries deliberately stock reserves to unrequired levels despite these measures. In some countries, IR management is determined by the law and the objectives determined by the monetary authorities rather than by the economic and financial realities of the day.

In view of the above, it is clear that production output affects IR accumulation. The inelasticity of the product in the market enables OPEC to control its supply, often in disagreements with other major non-OPEC producers such as Russia, the United Kingdom and the United States. As a cartel, its formation brought major macroeconomic issues to the attention of many countries, including its members. Other non-OPEC crude producers formed the OPEC+ to control the market. Meanwhile, the largest non-OPEC producers remain the United States, China and Russia (the only one in Eastern Europe).

Interestingly, nearly all large producers are invariably large consumers, leaving little for export except Russia, for which it has gained a tremendous amount of IRs. Russia with an annual crude production of 540.5 million barrels, supplies most of the CEE countries. Other European producers are relatively insignificant, mainly the United Kingdom and Norway (Energy Information Administration 2021).

Oil prices and the market situation are essential to news about OPEC. Plante (2019) measured and correlated oil price volatility with cartel meetings. Newspaper reports that

shocks to the index is also correlated with Google searches on oil price volatility. However, idiosyncratic events generate excessive volatility in extreme cases, like the Kuwaiti invasion and the Iraq and Iran wars. Since they collectively control about 79% of total fossil fuel reserves, OPEC members can stock up reserves given the inelastic commodity they sell on the international market, should they desire. Despite the cartel's efforts to influence prices, there has always been a mean reversion of the prices. The network structure of the countries producing oil has changed over the years depending on the influence each obtained in production and export.

Recent studies on OPEC have focused on various issues. OPEC members have lost some ground since the other major producers discovered crude oil in some form (shale oil in the US). It has survived the headwinds of world market turbulence and cyclicality by understanding how weak cartel members should be accommodated and treated. Okullo and Reynes (2016) studied the cartel membership structure and concluded that membership heterogeneity prevents effective collusion by treating weak members with kindness, allowing the cartel to survive and persevere. Thus, OPEC decisions impact members and non-members alike, bringing a form of connectedness within both ranks (Al Rousana, Sbia, and Tas 2018).

Despite the level of connectedness between both OPEC and non-OPEC producers, the level of compliance with quotas among OPEC members is debatable for two glaring reasons. Firstly, each country's reserves depend on the quantity pushed to the market, and thus the capacity to absorb short-term shocks in total output. Secondly, the level of dependence on oil production as maintenance for macroeconomic performance among producers differs. Parnes (2019) analysed compliance among the OPEC, dividing them into three groups. The high and low complying countries exhibit relatively low compliance. Therefore, they cheat within the cartel, while mid-producing countries tend to comply more with the group's production demands.

Despite the declining importance of oil as a source of energy, Al-Fattah (2020) believes there is an insufficient supply of this commodity. This insufficiency in supply can easily be made up from major OPEC members and non-members (Saudi Arabia and Russia). The production capacities of non-OPEC countries, which currently make up 56% of total world output, are expected to go down and subsequently out of the world market as it has been declining at about 3.5% per annum. Gil-Alana, Dadgar, and Nazari (2020) deal with the interactions in the market, stratifying the three series into OPEC, non-OPEC and world producers, showing that the OPEC still maintains an edge in production and reserves. Thus, it has a comparative advantage because of its ability to reduce costs and produce more. The production of oil by OPEC has important implications for the global market, which means that it matters because it balances the market (Razek and Michieka 2019). In that study, it became clear that oil is a financial asset, and other global producers equally influence the pricing of the commodity just as OPEC does; so OPEC matters in global oil production and marketing.

Finally, the use to which the reserves of OPEC members should be for economic diversification and real production while embracing other sources renewable income to increase IRs. With globalisation, many countries have opened up, including OPEC members, encouraging inflows into their respective countries, since this increases IRs. Ibhagui (2020) studied the economic performance of capital inflows into OPEC using a disaggregated approach. He discovered that it is either significantly negative or, at best, insignificantly positive for most counties. For the three types of flows, i.e., Foreign Direct Investment (FDI), foreign portfolio investment (FPI) and foreign debt (FD), the effects of capital flows have been not beneficial. FDI indicates a short-term performance at best in most countries, while FPI shows a robust negative significance. For most countries, there is a relaxation of the restrictions on inflows and outflows of foreign capital for IRs liquidity.

Using FDI as a means of increasing the stocks of IRs can benefit OPEC members because of the liquidity effect of the foreign exchange position of the country. For instance, Saudi Arabia, arguably one of the ten countries with the highest IRs, is a leading member of OPEC. Alfalih and Bel Hadj (2020) studied the kingdom's FDI situation and reported that while the usual causal determinants are significant, FDI reacts more to oil price fluctuations than other determinants. Olayungbo (2019) studied the impact of trade and reserves in the OPEC country of Nigeria and surmised that there is a long-term relationship between IRs and oil prices, implying that oil prices Granger-cause an increase in IRs in the short term. The paper recommended diversifying away from oil to other non-resource commodity exports to increase and improve the country's IR position. Adetiloye (2015) mentioned the country's foreign exchange management as being detrimental to the growth of domestic investment, recommending a stricter capital outflows regime for the country.

Methodology

Data and sources

Various studies support the independent variables adopted for analysis in the study. The variables include total reserves minus gold, exchange rates, inflation rates, commodity prices, foreign direct investment inflows, and gross domestic product. The variables were obtained from the World Development Indicators (The World Bank n.d.). They covered the 14 OPEC countries from 2005 to 2018.

Methodology and modelling

The analytical process started with the pooled ordinary least square (OLS) regression to more advanced system generalised methods of moments (Sy-GMM) through fixed and random effects (FE and RE). Arellano and Bond (1991) popularised the use

of the GMM with advanced properties that enable it to exploit all restrictions with no serial correlation in errors and individual-specific effects. Of the two GMMs, i.e., the difference GMM and the system GMM (Sy-GMM), Sy-GMM is preferred. It has two variants, of which the two-step Sy-GMM is adopted for analysis in this study. Specifically, the differenced GMM is known not to allow country-specific effects, while the one-step Sy-GMM does not produce efficient estimators like the two-step Sy-GMM does (Bond, Hoeffler, and Temple 2001).

The modelling process begins with the pooled OLS as below

$$\ln Yit = \varnothing \ln Yit_{-1} + yz_{it} + di + \varepsilon_{it} \tag{1}$$

$$i = 1, 2….Nit = 1,2….T$$

$$\ln Y_{it} = \varnothing \ln Y_{it-1} + yz_{it}^1 + dt + \varepsilon_{it}$$

$$y_{it} = \beta_0 + x_{it}\beta_{it} + Z_{it} + \alpha_{it} + \varepsilon_{it} \tag{2}$$

For the Sy-GMM, the original equation is

$$y_{it} = \delta y_{it-1} + \beta_{xit} + \mu_i + v_{it} \tag{3}$$

and for the transformed model, it is

$$\Delta y_{it} = \Delta y_{it-1} + \Delta x_{it} + \Delta v_{it} \tag{4}$$

The model is explicitly shown below:

$$lresers_{it} = lencrs_{it} + lexhr_{it} + lfdi\_\inf_{it} +$$
$$+ lGdp_{it} + lCrdpr_{it} + lopns_{it} + lNrspdc_{it} + \varepsilon \tag{5}$$

where, *resers, encrs, exhr, FDI_inf, GDP, inf_R, Crdpr, opns, Nrspdc* all stand for IRs of a particular country, economic or financial crises index, exchange rate (NEER), inflation rate, gross domestic product (GDP), crude oil price, economic openness, and natural resource dependence, respectively, all in log form.

The independent variables

The first is the oil price. It is doubtful if oil prices affect holdings of IRs, encourages hoarding or dispensing of foreign exchange. An increase in the price of the commodity has a relationship with other variables. Bankole and Shuaibu (2013) showed that

a higher oil price has a positive effect on the IR in their study for Nigeria. It is unclear if this is the case for all countries. With a Vector Autoregressive (VAR) estimation process, the study confirmed the impact of prices through the coefficient as it was marginally positive.

The role of the exchange rate in IR accumulation is adopted following Aizenmann and Riera-Crichton (2008). They showed that the impact of the real practical exchange rate on IRs cushions the impact of adverse terms of trade in developing countries, which is highly needed by those countries when oil trade and prices are volatile. The depth achieved by the financial system mitigates the need for this. This is not the case for developed countries, where the depth of the financial system acts as a shock absorber on its own. Bankole and Shuaibu (2013) maintained the same trend in the argument on oil price: this is positive but marginal for Nigeria. Thus, for OPEC members, the exchange rate as a determinant is not ascertained.

FDI inflows are a strong and positive contributor to the accumulation of IRs by most countries and OPEC. As far as FDI is concerned, the retention of IR is made possible as it becomes stocks of investment, as the inflows are not volatile like the portfolio flows. The country's GDP measures the total services and goods produced in a country that reflect the effect of an increase or decrease in countries' stocks of IRs. In this case, a higher production level will increase exportable goods apart from crude.

Inflation rate, economic crises and economic openness

Since inflation increases the prices of goods and services within a country, Steiner (2017) demonstrated through panel data analysis that inflation has a negative impact on the holding of IRs as one of the significant drawbacks of IR accumulation, both at the global and individual country level. Dominguez, Hashimoto, and Ito (2012) earlier discussed the role of international crises in IR management and accumulation. The decision to acquire or dispose of foreign assets is influenced by the economic and financial performance of the specific countries.

IR is particularly sensitive to financial flows as caused by globalisation. The more open a financial system is, the more flows it should experience, which could go either way, depending on the economic conditions at the domestic level in the particular country. The experience has been remarkably more spontaneous for emerging market countries than for developed ones (Choi, Sharma, and Strömqvist 2007).

Results and output of estimates

Table 1 presents the summary statistics of the variables used in the econometric analysis of the study. The analysis shows the statistical distribution of the variables. The statistics adopted include the mean, maximum, minimum and the analysis of the symmetric distribution of the variables. The *total reserves in months of imports* (*ENCRS*) have a mean of approximately 13.5, a minimum of 0.87 and a maximum of 79.34. This implies that, on average, the OPEC member countries are economically healthy and capable of financing their imports bill for up to thirteen and a half months. The statistics show that the exchange rate (Local Currency Unit: LCU to the dollar) values differ significantly among OPEC member countries. It has a mean of 1447, a minimum of 0.269, and a maximum of 40864; while a few countries have their local currency almost on par with the dollar, the disparity seems large in others. However, on average, a unit of dollar equals about 1447 units of LCU of OPEC member countries.

Also, FDI inflow, as a percentage of GDP, significantly differs among the countries, with a mean of about 2.9, a minimum of –6.1 and a maximum of 50.6. The distribution shows that some economies have attracted a large chunk of FDI to improve their GDP, while it is negative in others. The volume of FDI attracted could have been spurred by a myriad of determinants, such as the level of economic progress and institutional development attained over time. Nevertheless, the liquidity of members has been greatly assisted by oil-exporting activities.

In the same way, the GDP volume also differs across the OPEC member states, with an average of about $200 billion, a minimum of $9 billion and a maximum of about $700 billion. The statistics also show the relative productivity of the economies of the cartel, whose economies are driven primarily by oil export proceeds. Despite this, a number of the economies have successfully diversified their export base, thus reducing their dependence on exporting oil and making their economies more productive and competitive. For some countries, it cannot be agreed that all revenues yielding efforts were from oil exports.

The reserve has a mean of $67.5 billion, a minimum of $45.5 million and a maximum of $703 billion. A standard deviation of about $103 billion also shows a large disparity among the OPEC members and accumulated international reserves. The reserve value also reflects the competitiveness and diversity of the export base of an economy. As before, oil exports might not be the sole source of reserve accumulation. A net exporting economy tends to be able to boost reserves quicker than a net importing economy. Similarly, the inflation rate is modest at 11.2% among the countries, though reaching a maximum of about 254.9% in one country. The maximum shows considerably large inflation that could be counter-productive and which erodes the purchasing power in the economies' currencies concerned.

Table 1. Descriptive statistics of major variables

Var.	ENCRS	EXHR	FDI_IN	GDP	RESRS	INFR	CRDPR	OPNS	NRSDPC
Mean	13.4858	1447.001	2.89943	2.00E+11	6.75E+10	11.175	77.441	0.86374	0.892225
Median	6.655604	75.03335	1.155547	1.36E+11	2.72E+10	4.4155	71.88	0.81769	0.922566
Maximum	79.23722	40864.33	50.63641	7.02E+11	7.32E+11	254.95	111.96	1.76145	1
Minimum	0.879804	0.268828	−6.10498	9.31E+09	45502925	−60.496	44.04	0.29785	0.451216
Std. Dev.	14.52461	5362.706	6.60413	1.83E+11	1.31E+11	33.132	23.092	0.34613	0.110877
Skewness	1.763411	5.130581	4.621005	0.878982	3.37812	6.2435	0.2599	0.50434	−1.87976
Kurtosis	6.231899	30.69263	30.62695	2.656471	14.47068	45.659	1.6015	2.70107	6.547853
Jarque-Bera	149.6971	7595.176	7390.44	27.94025	1439.94	16299	19.479	9.40762	233.8103
Probability	0	0	0	0.000001	0	0	6E−05	0.00906	0
Sum	2117.271	302423.2	605.9809	4.19E+13	1.32E+13	2212.6	16263	176.203	187.3672
Sum Sq. D.	32910.45	5.98E+09	9071.823	6.93E+24	3.32E+24	216257	111449	24.3208	2.569371
Observations	157	209	209	209	195	198	210	204	210

Source: data from the World Development Indicators and from the system.

Consequently, the statistics show that for the period considered, the price of crude fluctuated, reaching a maximum of $112, an average of $77.4 and a minimum of $44.04 per barrel. It is now generally accepted that a price less than the average stated here can be disastrous for the economy of a typical member. However, prices reached a floor of $20 in the COVID–19 lockdown, while the standard deviation of 23 shows significant fluctuations and volatility in prices over the years. In addition, the table shows the relative dependence of OPEC members on commodity exports. The statistics show that, on average, OPEC member states are heavily dependent on commodity exports with an average of 89%, which implies that primary commodity exports constitute about 89% of all merchandise exports of all OPEC member countries. The indicator has a maximum of one, indicating that 100% of primary commodity exports constituted the entire exports of some of the economies in this category, while the minimum value is 45%. This reflects that some economies in the cartel have considerably diversified their export base from primary commodities. The level of diversification did not seem significant from this point. The openness of a typical economy is 0.86, close to the median economy. With 1.76, it means that some countries are entirely open, while at 0.29, some are quite closed. The deviation for openness indicates that there is not much disparity between closed and open countries. Table 1 shows other details.

Correlation table

Table 2 shows the correlation matrix for the variables to test the possible multicollinearity among the variables. The highest coefficient of any two bivariates is −0.466, as shown by the correlation between openness and *GDP*. This simply means that a negative coefficient exists, though *r* is between these variables with negative implications and is not considered impactful. The nominal bivariate coefficient is only for the test of multicollinearity and did not indicate the possibility that a higher level of openness leads to a reduction in GDP as this coefficient would suggest. If this were the case, the relationship is not sufficiently strong to lead to that conclusion. On the other hand, the lowest possible coefficient is found between *NRSDPC* and *infr*, where the coefficient is positive but not significant. Since a superior test is being used, there is no need to test for the significance of any relationship at this level. The remaining bivariate relationships are shown in Table 2.

Table 2. Correlation Matrix – Multicollinearity test

Variable	CRDP	ENC	EXH	FDI_I	GDP	INFR	INST	NRSD	OPNS
CRDPR	1	0.111	−0.02	−0.061	−0.027	−0.10	−0.02	0.1369	0.130
ENCRS		1	−0.20	−0.050	0.279	−0.09	−0.06	−0.038	0.106
EXHR			1	0.212	−0.26	−0.11	−0.39	0.1633	−0.001

Variable	CRDP	ENC	EXH	FDI_I	GDP	INFR	INST	NRSD	OPNS
FDI_IN				1	–0.17	–0.08	–0.08	–0.221	0.365
GDP					1	0.217	0.044	–0.362	–0.466
INFR						1	–0.25	0.0626	–0.255
INST							1	–0.504	0.198
NRSDP								1	–0.189
OPNS									1

Source: system output from the data.

Multicollinearity test

Table 2 shows the test of collinear dependence among the explanatory variables in the model. The test was conducted to assess the extent of the linear relationship, which is necessary before attempting to combine the variables. Also, where there is high collinear dependence among the explanatory variables, examining the unique influence of the explanatory variables becomes problematic. It could yield a misleading parameter estimate and be unsuitable for drawing inferences and making a prediction. A careful observation of the statistics in Table 2 shows a moderate collinear relationship of –0.514.5 between natural resource dependence and institutions. This relationship is predictable, as several heavily resource-dependent economies (resource trap) are also weak institutionally. Despite this, the table shows no serious problem with multicollinearity. Hence, the variables are suitable to be combined for econometric analysis.

Determinants of interactional reserves

Table 3 shows the analysis of the determinants of international reserves. This comprises results using the pooled ordinary least squares, static panel estimation using fixed and random effect specifications, and the dynamic panel data estimation using the system generalised method of moments. The pooled OLS and static panel estimation approach serve as a baseline regression, while the dynamic panel estimation was adopted to assess the international reserve determinants for OPEC members. The rational choice of the dynamic panel has been well documented in the literature and the preceding section. This is anchored on the fact that some explanatory variables in the model failed the test of strict exogeneity. For instance, FDI, which the model treated as an exogenous variable, could also serve as an endogenous variable, thus making it susceptible to the endogeneity problem. Another reason for adopting the dynamic model is that maintaining international reserves encapsulates a network of policies that have long-run implications.

The dynamic panel estimation results in Table 3 reveal a direct relationship between the price of crude oil and international reserves, as a unit increase in crude oil price yields about a 4.2% increase in international reserves. This outcome is expected since crude oil constitute the bulk of export earnings for most OPEC member states. Thus, it is the major source of export earnings and budgetary financing for several of these economies. The proportionate response of the international reserves of OPEC member states to the price of crude reveals that the rationale for setting-up the cartel to regulate the international oil market, preventing black market operations and maintaining healthy pricing by manipulating the supply force. The crude oil price trend has been consistent with the trend in several economies with absolute dependence on oil price proceeds. The recent episodes of decline in international prices (with rising import bias) have left some of these economies in a problematic state, unable to ensure continuous budget financing (the OPEC disease) and plunging the economies into recession. For instance, Angola has experienced a severe economic depression resulting from the declining oil price before and during the COVID–19 pandemic. Meanwhile, Nigeria has had to reduce the oil price benchmark to finance its budgetary allocation from an initial \$60 per barrel to \$30 and later to \$20 per barrel. This scenario has weakened the economic outlook, expectations and performance of the country and many other oil-exporting economies.

Regressions outputs

Table 3. Determinants of international reserves

VARIABLES	(ols) Lresrs	(fe) Lresrs	(re) Lresrs	(sgmm) Lresrs
L.lresrs				0.416***
				(0.0715)
Lcrdpr	0.247**	0.293***	0.411***	0.0421
	(0.104)	(0.0799)	(0.0816)	(0.121)
Exhr	0.000298*	–0.00363***	0.000163	–0.00244***
	(0.000159)	(0.000818)	(0.000251)	(0.000922)
Infr	–0.00862***	–0.00342***	–0.00411***	–0.00213**
	(0.00136)	(0.00100)	(0.00119)	(0.000839)
lfdi_in	0.0128	–0.0528**	–0.0478	–0.123***
	(0.0335)	(0.0257)	(0.0302)	(0.0296)
Lencrs	1.013***	0.873***	0.988***	0.530***
	(0.0444)	(0.0695)	(0.0635)	(0.119)
Lopns	0.949***	0.551**	0.702***	1.622***

VARIABLES	(ols) Lresrs	(fe) Lresrs	(re) Lresrs	(sgmm) Lresrs
	(0.163)	(0.224)	(0.206)	(0.262)
Lnrsdpc	0.229	0.780	−0.547	1.654**
	(0.569)	(0.842)	(0.706)	(0.679)
Lgdp	1.006***	1.777***	0.912***	0.250
	(0.0539)	(0.249)	(0.0880)	(0.157)
Constant	−4.678***	−23.85***	−3.054	8.023**
	(1.285)	(6.063)	(2.161)	(3.843)
Observations	119	119	119	50
R-squared	0.972	0.812		
Number of id		12	12	5

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: system output from the data.

On the other hand, the exchange rate exerts a negative response on international reserves, as a unit increase in the exchange rate depletes resources by 0.24 units. This implies that changes in the exchange rate negatively impact reserves. The situation is not unusual from what is obtainable among oil-exporting African economies that are commodity-dependent and equally net importers. For instance, dwindling foreign exchange reserves coupled with falling crude oil proceeds and rising import bills can pressure foreign exchange demand, weakening the local currency. In this case, a swift reaction to defend the local currency value continuously depletes the reserve. The success of such an intervention depends on the soundness of the macroeconomic policy adopted. Otherwise, to maintain a considerable reserve level, restrictive pegging is disallowed, and the foreign exchange market can freely determine the value of the local currency.

The evidence among monocultural economies has always supported the fact that a falling exchange rate depletes reserves because the government attempts to stabilise the local currency, and there is a need to expend more foreign exchange in financing the import bills. In the same manner, reserves respond adversely to changes in inflation. A unit increase in inflation depletes reserves by 0.213 units. It implies that a general price hike in the economy makes exports relatively expensive and incapable of earning foreign exchange. It suggests that inflation reduces the competitiveness of the exportable good. Whether domestically generated or transmitted from abroad, the national produce becomes relatively expensive and uncompetitive. Hence, the economy loses a comparative edge in the ownership of natural and human resources. This is not unconnected with the experience in some oil-producing African economies where an efficient cost cannot be attained in refining crude oil and transforming it into finished goods. In contrast,

the process's gains are transferred across the border, and the same finished good is re-purchased at a higher value.

In addition, the indicator of reserves: months of import cover (economic crisis) varies directly with international reserves. The expectation is in line with this result, as the more significant the reserves, the more months of imports it can finance. Alternatively, the larger the reserves, the healthier the economy and its ability to absorb foreign exchange instability, which can distort budgetary financing or the sustainability of financing imports. Reserves ie. months of import cover suggest the dynamism of the export basket of an economy, which generates further foreign exchange and boosts the reserve volume. The evidence from Table 2 shows that economic stability (in terms of its reserves: months of import cover) raises the reserve volume.

Specifically, a unit increase in export dynamism leads to an approximately 53-unit accumulation in reserves. This evidence shows that dynamic economies that export manufactures and services tend to be relatively more prosperous and developed than their commodity export-dependent counterparts. This indicator of export dynamism and stability exerts the greatest influence on international reserves across all models estimated in this study. It shows the relevance of the call by development organisations and the continuous discourse for oil and other commodity-dependent economies to embrace horizontal diversification for oil and other commodity-dependent economies to embrace horizontal diversification of their export basket to escape the vicious cycle of commodity misalignment in pricing. Among the OPEC member states, Abu Dhabi, where there has been considerable diversification into tourism and hospitality, thereby reducing dependence on crude oil price earnings, leaves hope, especially for the African OPEC members, where there has been little commitment to attaining an expanded export basket.

As expected, natural resource dependence exerts a significant impact on the international reserves of OPEC member states because, in the average OPEC country, commodity exports (oil) constitute about 89.2 per cent of their entire merchandise exports. The majority of these economies are highly dependent on commodity exports for their foreign exchange earnings, fiscal expenditure and macroeconomic stability. Specifically, the result shows that every unit increase in resource exports accumulates reserves by about 65.4 units. Though the empirics sounds interesting and would suggest that a commodity-dependent economy should expand its commodity extraction and exports, it is necessary to note that excessive commodity dependence also creates a widening gap between consumer goods and food imports capable of yielding a negative substitution (net) effect. In buttressing the foregoing, the results show that GDP does not significantly influence international reserves. This is linked to the previously established fact that most OPEC member countries depend on commodity exports with little or no value addition for the bulk of their reserve earnings.

In the same manner, several of these economies are plagued with the Dutch disease. The discovery of oil led to the neglect of other prominent sectors of the economy, limiting productivity, exports volume and resisting economic opportunities. The discovery of natural resources, such as oil, precipitates a decline in other sectors and is incapable of ensuring domestic diversification to generate foreign exchange but exerts pressure on the economy by increasing consumer imports and food bills.

Table 4. Determinants of international reserves: controlling for the price of crude and exchange rate volatility

VARIABLES	(ols) Lresrs	(fe) Lresrs	(re) Lresrs	(sgmm) Lresrs
L.lresrs				0.526***
				(0.0877)
crdpr_v	0.736*	0.283	0.736*	0.350
	(0.381)	(0.310)	(0.381)	(0.420)
exhr_v	–1.776**	1.090	–1.776**	–0.0603
	(0.769)	(0.795)	(0.769)	(0.945)
Infr	–0.00869***	–0.00493***	–0.00869***	–0.00326***
	(0.00159)	(0.00134)	(0.00159)	(0.00102)
lfdi_in	–0.0307	–0.0572	–0.0307	–0.0803**
	(0.0476)	(0.0408)	(0.0476)	(0.0395)
Lencrs	0.962***	0.930***	0.962***	0.511***
	(0.0585)	(0.108)	(0.0585)	(0.187)
Lopns	0.898***	0.765**	0.898***	1.144**
	(0.178)	(0.324)	(0.178)	(0.511)
Lnrsdpc	2.017*	2.980**	2.017*	6.053***
	(1.057)	(1.389)	(1.057)	(1.024)
Lgdp	0.910***	1.431***	0.910***	0.298
	(0.0641)	(0.369)	(0.0641)	(0.194)
Constant	–1.173	–14.68	–1.173	2.857
	(1.545)	(9.133)	(1.545)	(3.856)
Observations	85	85	85	38
R-squared	0.958	0.687		
Number of id		9	9	4

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: output from the system.

The results show that foreign direct investment is significant but exerts a less proportionate effect on international reserves. The evidence that supports this result be discussed in two ways. First, most FDI inflows into resource-dependent economies are rent-seeking. They may not yield an impressive economic gain despite the domestic economy partly financing such initiatives using foreign earnings. The relatively weak institutions and the perception of the policy actors in most commodity-dependent economies encourage such manipulation in which the locals are deprived of economic resources with no compensation or economic benefit. A number of these scenarios have played out in African economies, where foreigners collude with government actors to grab economic resources and land to support the economy and livelihood in the foreigners' home countries. In Nigeria and other African countries, the agriculture, oil and gas, and steel sectors have witnessed unyielding direct foreign involvement. The local economy invests expensively without any corresponding economic benefits. After many years of heavy repatriation of value and transfer of economic resources to their home countries, such projects have been abandoned.

Secondly, the lower responsiveness of international reserves to changes in foreign direct investment could have resulted from the weak absorptive capacity of the locals to attract/absorb the skills and expertise of the expatriates/the technical assistance financed by the domestic government. This weakness in absorbing the necessary skills reflects the weakness in the social and physical infrastructures required to build the capacity of the national workforce. Finally, the composite governance indicator shows a significant and positive effect on international reserves, indicating that an effective governance framework is considered necessary in accumulating and maintaining a healthy reserve level.

Consequently, Table 4 shows the implication of crude oil price volatility and exchange rate volatility on the international reserves of OPEC member states. Table 3 already indicated the effect of the exchange rate and crude oil price on reserves. However, due to constant changes in these indicators and their critical role in influencing the volume of reserves for oil-rich resource economies, it also becomes pertinent to examine how their volatility influences the volume of reserves. The results show that the volatility of the crude oil price inversely impacts reserves. Specifically, 1 unit increase in the price of crude oil changes reserves by about 15 units.

Fluctuations in the crude oil price are significantly linked to reserves. In fact, the reserve receives the first impact of negative oil price volatility because crude oil price receipts are strongly linked to reserves due to the heavy concentration on oil price proceeds. Similarly, exchange rate volatility exerts a negative influence on reserves but with a lesser magnitude compared with the volatility of crude oil price. The exchange rate fluctuates, especially when it is incessant, due to the mal-alignment of foreign exchange inflow and outflow' i.e. when there are net flows. In this case, the pressure on foreign exchange to finance imports,

support overseas transactions and the repatriation of FDI gains weakens the local currency, resulting in a rising exchange rate. The rising exchange rate makes imports more expensive and further depletes the reserves due to the weak income elasticity of crude oil exports. Following the control for the volatility variables, the signs and the significance of the significant explanatory variables remain stable. The natural resource dependence, reserves in import months, and degree of openness directly affect international reserves and are important determinants of the same, while inflation rate, FDI inflows, and institutions inversely influence international reserves. For CEE countries (non-oil producers), the accumulation of IRs increased greatly after the global financial crisis. In contrast, Russia (a non-OPEC oil producer), which diversified its sources of oreign exchange-earning capacity, has maintained increasing IRs, from an average of $454.97 billion pre-COVID–19 to over $600 billion post-COVID–19.

Concluding remarks and recommendations

From the objective of the study, the long-run determinants of IR accumulation among OPEC members include inflation, economic crises, and crude oil dependence, which have differential impacts on the total reserves of the cartel members. While inflation is unfavourable for IRs externally, it is not also good on the domestic side. Equally, the exchange rate (which implies the use of the exchange rate system) is debilitating for these counties' accumulation and maintenance of IR. With this discovery, the question that must be answered is: What type of exchange rate management is used by the countries? OPEC members used variants of the floating exchange rate system. This means that the ER management is not entirely floating but managed, many under dirty floating.

On the positive side, the crude oil price, economic crises, and the openness of the economy are strong positive determinants of IRs among the members. Higher crude prices have always meant buyers of crude pay more; economic crises for most other countries have always been a blessing to OPEC members, as they tend to profit more from the ensuing instability of other countries and crises around the world. This is a significant contribution of this study. The openness of the economy to the world indicates a vital positive sign and is a new discovery as competition, though desired, has not been practised by most members. If the openness achieved by these economies could be positive at this level, then there is a need to open more. Generally, a higher level of production of goods and services will help boost the IRs for OPEC members, as indicated by the significance of GDP in the regressions.

The Sy-GMM outputs indicate that the crude oil price, exchange rates and GDP are insignificant in the estimation process. Crude oil price and GDP were positively insignificant, while the exchange rate was negatively insignificant. The outputs of these estima-

tions show that the inflation rate and FDI are negatively significant. FDI inflows were particularly negative with the estimations.

The paper concludes with the following recommendations to the cartel as a body. Firstly, economic openness should be practised as much as possible. This enables the individual countries to maintain an excellent competitive environment for their respective economy. At the same time, each of them should diversify from crude to other sustainable goods and services that can be exported. Secondly, in a crisis period among other countries, members should maximise production and exports to increase their IRs. Thirdly, policies or programmes that would make FDI inflows more stable and profitable must be explored and put in place in the long run. One common determinant for FDI in most OPEC members is the attraction to the extractive sector. Diversification should also encourage the inflows of FDI into other sectors of the economy. A contribution of the study lies in the fact that OPEC countries do not sufficiently diversify their economies to increase the production of other goods and services that can grow their IRs. Rather, they depend on the continuous export of crude, which subjects them to the vagaries of volatilities of the crude petroleum export market.

References

Adetiloye, K.A. (2015), *Business Investment and the Nigerian Investible Capital Hemorrhage in Financial Crises*, [in:] C. Das (ed.), *Handbook of Research on Globalization, Investment, and Growth-Implications of Confidence and Governance*, IGI Global, Hershey, pp. 416–436, https://doi.org/10.4018/978-1-4666-8274-0.ch020

Aizenman, J. (2008), *International Reserve Management and the Current Account*, [in:] K. Cowan, S. Edwards, R.O. Valdés (eds.), *Current Account and External Financing*, Central Bank of Chile, Santiago, pp. 435–474.

Aizenman, J., Ito, H. (2012), *Trilemma policy convergence patterns and output volatility*, "The North American Journal of Economics and Finance", 23 (3), pp. 269–285, https://doi.org/10.1016/j.najef.2012.03.002

Aizenman, J., Riera-Crichton, D. (2008), *Real Exchange Rate and International Reserves in an Era of Growing Financial and Trade Integration*, "The Review of Economics and Statistics", 90 (4), pp. 812–815, https://doi.org/10.1162/rest.90.4.812

Aizenman, J., Cheung, Y., Qian, X.W. (2019), *The currency composition of international reserves, demand for international reserves, and global safe assets*, "Journal of International Money and Finance", 102, 102120, https://doi.org/10.1016/j.jimonfin.2019.102120

Al Rousana, S., Sbia, R., Tas, B.K.O (2018), *A dynamic network analysis of the world oil market: Analysis of OPEC and non-OPEC members*, "Energy Economics", 75, pp. 28–41, https://doi.org/10.1016/j.eneco.2018.07.032

Al-Fattah, S.M. (2020), *Non-OPEC conventional oil: Production decline, supply outlook and key implications*, "Journal of Petroleum Science and Engineering", 189, 107049, https://doi.org/10.1016/j.petrol.2020.107049

Alberola, E., Erce, A., Serena, J.M. (2015), *International reserves and gross capital flows dynamics*, "Journal of International Money and Finance", 60, pp. 151–171, https://doi.org/10.1016/j.jimonfin.2015.09.003

Alfalih, A.A., Bel Hadj, T. (2020), *Foreign direct investment determinants in an oil abundant host country: Short and long run approach for Saudi Arabia*, "Resources Policy", 66, 101616, https://doi.org/10.1016/j.resourpol.2020.101616

Arellano, M., Bond, S. (1991), *Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations*, "The Review of Economic Studies", 58 (2), pp. 277–297, https://doi.org/10.2307/2297968

Bankole, A.S., Shuaibu, M.I. (2013), *International Reserve and Oil Price Movement: Evidence from Nigeria*, "Ibadan Journal of the Social Sciences", 11 (2), pp. 70–85.

Bond, S.S., Hoeffler, A., Temple, J. (2001), *GMM Estimation of Empirical Growth Models*, "Economics Papers", W21 (1), Economics Group, Nuffield College: University of Oxford.

Choi, W.G., Sharma, S., Strömqvist, M. (2007), *Capital Flows, Financial Integration, and International Reserve Holdings: The Recent Experience of Emerging Markets and Advanced Economies*, "IMF Working Paper", WP/07/151, https://doi.org/10.5089/9781451867152.001

Čech, Z., Jevčák, A. (2011), *International reserves in the CEE8 – lessons from the financial crisis*, "ECFIN Country Focus", 8 (2), pp. 1–8.

Dominguez, K.M.E., Hashimoto, Y., Ito, T. (2012), *International reserves and the global financial crisis*, "Journal of International Economics", 88 (2), pp. 388–406, https://doi.org/10.1016/j.jinteco.2012.03.003

Dooley, M.P., Folkerts-Landau, D., Garber, P. (2004), *An Essay on the Revived Bretton Woods System*, "NBER Working Paper National", No. 9971, National Bureau of Economic Research, Cambridge, https://doi.org/10.3386/w9971

Energy Information Administration (2021), *Annual energy Outlook 2021 with projections to 2050*, https://www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf (accessed: 2.06.2022).

European Central Bank (2006), *The Accumulation of Foreign Reserves*, "Occasional Paper Series", No. 43, https://www.ecb.europa.eu/pub/pdf/scpops/ecbocp43.pdf (accessed: 17.03.2021).

European Central Bank (2012), *The external environment of the euro area*, "Economic and Monetary Developments. ECB Monthly Bulletin", June, https://www.ecb.europa.eu/pub/pdf/mobu/mb201310en.pdf (accessed: 21.03.2022).

Fischer, S. (2001), *IMF/World Bank International Reserves: Policy Issues Forum – Opening Remarks by IMF First Deputy Managing Director Stanley Fischer*, International Monetary Fund, http://www.imf.org/external/np/speeches/2001/042801.htm (accessed: 3.06.2022).

Frenkel, J.A., Jovanovic, B. (1981), *Optimal International Reserves: A Stochastic Framework*, "The Economic Journal", 91 (362), pp. 507–514, https://doi.org/10.2307/2232599

Gil-Alanaab, L.A., Dadgar, Y., Nazari, R. (2020), *An analysis of the OPEC and non-OPEC position in the World Oil Market: A fractionally integrated approach*, "Physica A: Statistical Mechanics and its Applications", 541 123705, https://doi.org/10.1016/j.physa.2019.123705

Gosh, A.R., Ostry, J.D., Tsangarides, C.T. (2014), *Accounting for emerging market countries' international reserves: Are Pacific Rim countries different?*, "Journal of International Money and Finance", 49 (A), pp. 52–82, https://doi.org/10.1016/j.jimonfin.2014.05.006

Ibhagui, O.W. (2020), *The Economic Performance Effects of Capital Flows in OPEC Member Countries*, "The Quarterly Review of Economics and Finance", 75, pp. 67–83, https://doi.org/10.1016/j.qref.2019.05.015

International Monetary Fund (2009), *International Monetary Fund. Annual Report*, http://www.imf.org/external/pubs/ft/ar/2009/eng/pdf/a1.pdf (accessed: 2.06.2022).

International Relations Committee Task Force (2006), *The Accumulation of Foreign Reserves*, "European Central Bank Occasional Paper", No. 43, February.

Irefin, D., Yaaba, B.N. (2011), *Determinants of foreign reserves in Nigeria: An autoregressive distributed lag approach*, "CBN Journal of Applied Statistics", 02 (2), The Central Bank of Nigeria, Abuja, pp. 63–82.

Jeanne, O., Rancière, R. (2006), *The Optimal Level of International Reserves for Emerging Market Countries: Formulas and Applications*, "IMF Working Paper", WP/06/229, https://doi.org/10.5089/9781451864892.001

Lane, P.R., Milesi-Ferretti, G.M. (2007), *The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970–2004*, "Journal of International Economics", 73 (2), pp. 223–250, https://doi.org/10.1016/j.jinteco.2007.02.003

Lawrence, H.S. (2006), *Reflections on Global Account imbalances and Emerging Markets Reserves Accumulation*, Paper presented at J.K. Jha Memorial Lecture, March.

Lee, S.S., Luk, P. (2018), *The Asian Financial Crisis and international reserve accumulation: A robust control approach*, "Journal of Economic Dynamics and Control", 90, pp. 284–309, https://doi.org/10.1016/j.jedc.2018.03.010

Moosa, I.A. (1992), *The demand for international reserves by OPEC countries: some empirical estimates*, "OPEC Review", 16 (4), pp. 441–453, https://doi.org/10.1111/j.1468-0076.1992.tb00443.x

Okullo, S.J., Reynes, F. (2016), *Imperfect cartelisation in OPEC*, "Energy Economics", 60, pp. 333–344, https://doi.org/10.1016/j.eneco.2016.10.010

Olayungbo, D.O. (2019), *Effects of Global Oil Price on Exchange Rate, Trade Balance, and Reserves in Nigeria: A Frequency Domain Causality Approach*, "Journal of Risk and Financial Management", 12 (1), p. 43, https://doi.org/10.3390/jrfm12010043

Parnes, D. (2019), *Heterogeneous noncompliance with OPEC's oil production cuts*, "Energy Economics", 78, pp. 289–300, https://doi.org/10.1016/j.eneco.2018.11.023

Pineau, G., Dorrucci, E., Comelli, F., Lagerblom, A. (2006), *The Accumulation of Foreign Reserves*, "European Central Bank Occasional Paper", No. 43, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=807417 (accessed: 3.06.2022).

Plante, M. (2019), *OPEC in the news*, "Energy Economics", 80, pp. 163–172, https://doi.org/10.1016/j.eneco.2018.12.025

Razek, N.H.A., Michieka, N.M. (2019), *OPEC and non-OPEC production, global demand, and the financialisation of oil*, "Research in International Business and Finance", 50, pp. 201–225, https://doi.org/10.1016/j.ribaf.2019.05.009

Reddy, Y.V. (2006), *Foreign exchange reserves: new realities and options*, "BIS Review", 87, pp. 1–6, https://www.bis.org/review/r060921c.pdf (accessed: 20.05.2021).

Shin, H.S., Turner, P. (2015), *What does the new face of international financial intermediation mean for emerging market economies?*, "Financial Stability Review", 19, pp. 25–36.

Steiner, A. (2017), *Does the accumulation of international reserves spur inflation? A reappraisal*, "The North American Journal of Economics and Finance", 41, pp. 112–132, https://doi.org/10.1016/j.najef.2017.03.007

Summers, L.H. (2007), *Reflections on Global Account Imbalances and Emerging Markets Reserve Accumulation*, https://ideas.repec.org/p/ess/wpaper/id1042.html (accessed: 20.05.2021).

The World Bank (n.d.), *World Development Indicators*, https://databank.worldbank.org/source/world-development-indicators (accessed: 19.06.2020).

Williamns, M.V. (2005), *Foreign exchange reserves – how much is enough*, https://www.bis.org/review/r060123c.pdf (accessed: 11.03.2021).

Determinanty rezerw międzynarodowych w ramach Organizacji Krajów Eksportujących Ropę Naftową (OPEC)

Państwa członkowskie Organizacji Krajów Eksportujących Ropę Naftową (OPEC) są nieustannie przedmiotem zainteresowania mediów w obszarze cen i wielkości dostaw ropy naftowej na rynek międzynarodowy. Jedną z ekonomicznych przyczyn tego zainteresowania jest kwestia płynności i chęci gromadzenia rezerw międzynarodowych przez poszczególne kraje. W niniejszej pracy przeanalizowano determinanty tworzenia rezerw międzynarodowych w ramach organizacji na tle motywów utrzymywania rezerw. zmienne przyjęte na podstawie danych z lat 2005–2018 zostały przetestowane przy pomocy systemu uogólnionych metod momentów (Sy-GMM). Zmiennymi tymi były: inflacja, kursy walutowe, ceny ropy naftowej, stopień zależności od ropy naftowej, kryzysy gospodarcze i inne. Wyniki analizy pokazują, że inflacja miała ujemny wpływ zewnętrzny i wewnętrzny, podczas gdy napływ BIZ był istotnie ujemy. Kryzysy gospodarcze i otwartość gospodarcza miały statystycznie istotny, dodatni wpływ na akumulację rezerw międzynarodowych, natomiast ceny ropy i kursy walutowe nie były istotnymi determinantami akumulacji rezerw międzynarodowych. Artykuł rekomenduje maksymalizację wykorzystania możliwości, jakimi dysponują członkowie organizacji w czasie kryzysów gospodarczych, w celu gromadzenia rezerw, co umożliwi im uniezależnienie się od eksportu ropy naftowej i uwzględnienie w ich eksporcie także innych produktów oraz zwiększenie otwartości gospodarki na konkurencję, co powinno wzmocnić gospodarkę.

Słowa kluczowe: rezerwy międzynarodowe, Organizacja Krajów Eksportujących Ropę Naftową, ceny ropy naftowej, kursy wymiany, handel międzynarodowy