



VEPR Policy Discussion Note

PD-04

Impacts of crude oil market changes on state budget

VEPR Research Division

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Fluctuations on the global crude oil market

This is the first time since the last 12 years, Brent crude oil spot prices have officially slumped to lower than 30 USD/barrel on 12th January 2016. Large institutions such as Goldman Sachs (2015) or EIA (2016a) both offer prospects of a short-term decrease of crude oil price. The bottom and trend of crude oil price are expected to mainly depend on two factors: (i) the supply-demand balance; and (ii) the global available storage capacity.

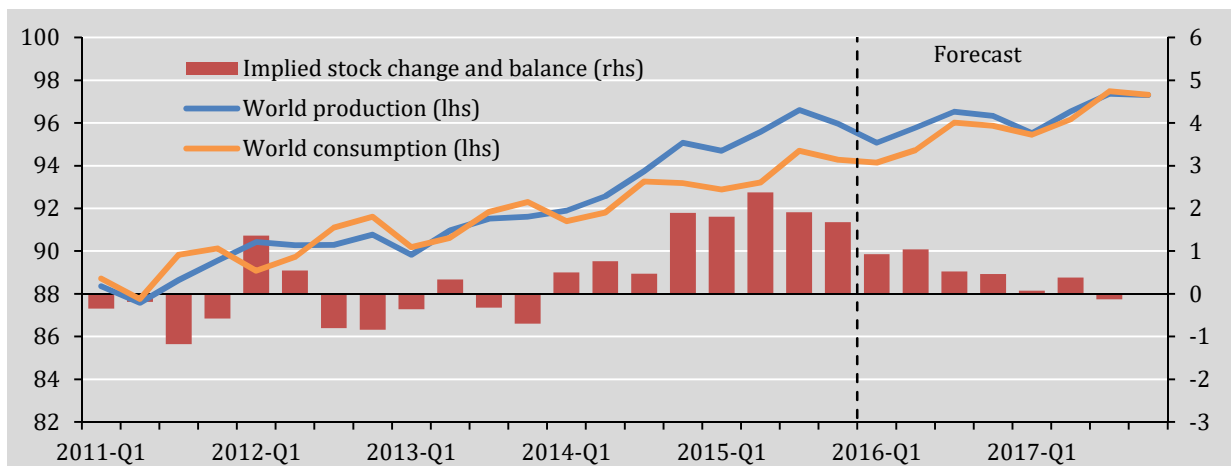
Supply-demand Balance

Up to Q4/2015, the global Petroleum and Other Liquids market saw an oversupply at an average of 1.41 million barrels/day in 8 consecutive quarters.)

That outputs proliferated while global demands slowed down caused an imbalance in the market. Horizontal drilling technology leads to a profound increase in the US output and becomes one of the major reasons for the proliferation. Among the increase of 5.26 million liquid fuels barrels per day in 2012 – 2015, 4.22 million barrels came from the USA (equal to 80% of the added volume). Crude oil yield of the USA in 10/2015 nearly doubled to 9.4 million barrels per day in average in comparison to the same period in 2008, roughly equal to the two countries with highest oil production - Russia and Saudi Arabia.

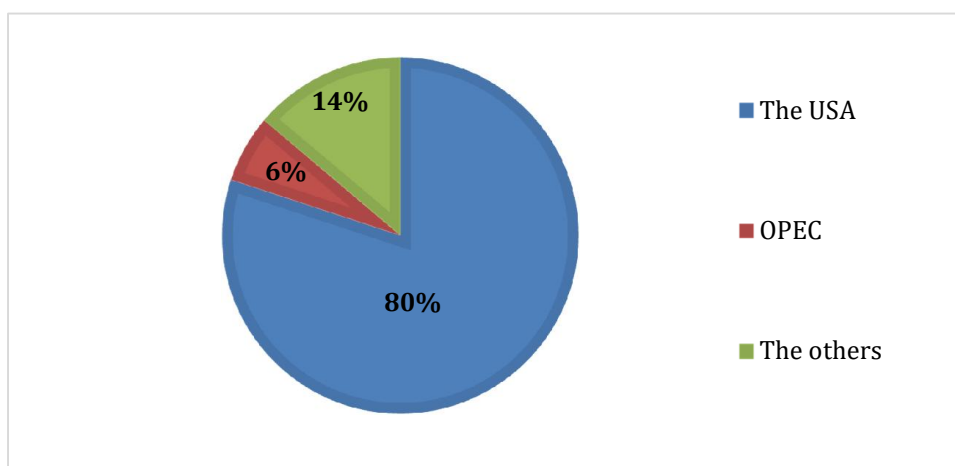
In the meantime, since the end of 2014, the world has witnessed a decline in energy demands deriving from China and the new emerging economies. Energy consumption fell in absolute number in three consecutive quarters before a slight recovery in Q3/2015 and continued the downward trend in Q4/2015. The continually dreary growth prospect in emerging countries is hindering expectations on a rebound of the oil price in 2016.

Figure 1. World Liquid Fuels Production and Consumption Balance (million barrels/day)



Source: EIA (2016a)

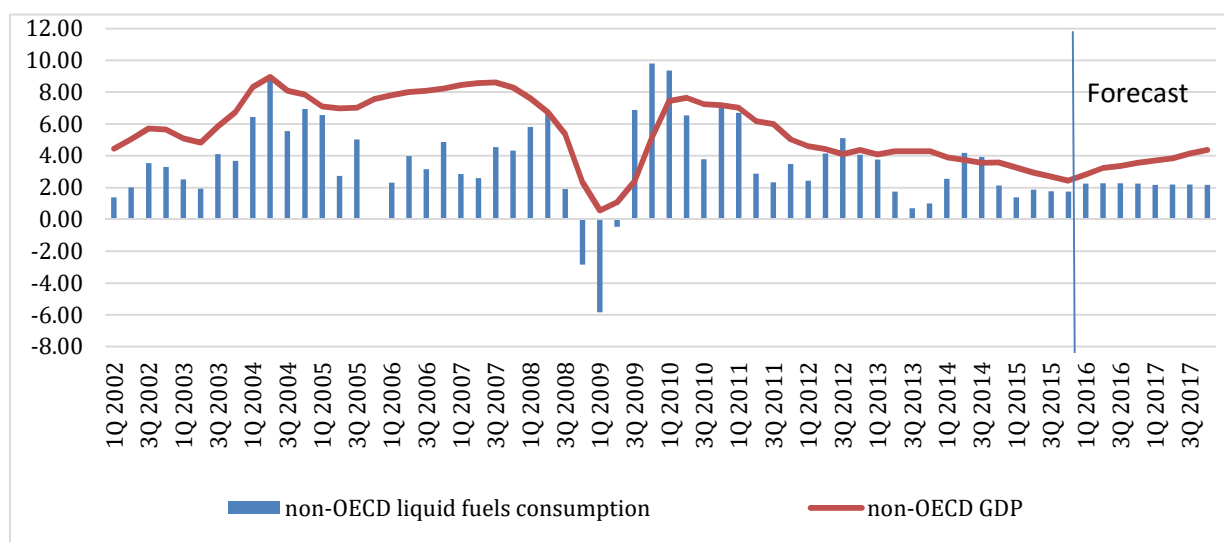
Figure 2. Proportion of liquid fuels changes by region, 1/2012 – 12/2015 (%)



Source: EIA (2016a)

Besides the negative trend in middle-term supply – demand balance, short – term changes exerted great pressure on the oil price. Oversupply has become more severe when Iran could increase the exporting oil volume to more than 2.8 million barrels/day since some sanctions on Iran were lifted on 16th January 2016. According to EIA forecast (2016b), the exporting volume from Iran is expected to surge 0.6 and 0.9 million barrels/day in 2016 and 2017 respectively, equal to its volume before the imposition of sanctions in 2011. Despite of being modest, the increase dramatically affects the imbalanced market.

Figure 3. Liquid Fuels Consumption and GDP Growth Rate of Non – OECD Countries, Q1/2002 – Q4/2017 (yoy)



Source: EIA (2016c)

In the context of a significant rise in crude oil production, in the Dec 2015 meeting, Organization of the Petroleum Exporting Countries (OPEC) decided to raise the volume ceiling level from 30 million barrels/day to 31.5 million barrels/day¹ instead of implementing a cut down on volume like previous oil price declines.

There are disagreements among OPEC countries, particularly between allies of Saudi Arabia and Iran and other countries. According to DallasFED (2015), these divisions stem from 3 major reasons: (i) the failure to reach a consensus on oil exporting volume of member countries after sanctions on Iran are lifted while member countries still want to maintain their previous shares; (ii) tensions in the Syrian conflict having deepened regional rivalries ; (iii) differences in reactions of member countries against the oil price decline because of different effects of these declines on these countries' fiscal statements.)

It should be noticed that major suppliers like Saudi Arabia or Iran both have an advantage of huge asset reserves to resist against the prolonged low in oil price when they raise their outputs to maintain their shares. Another advantage of these suppliers in OPEC to eliminate competitors is low cost of oil production. Marginal costs in oil production of Saudi Arabia is low at 5 USD/barrel in comparison to 30 USD of Russia or 33 USD of the USA (shale oil extraction). The above factors prevent OPEC from the formation of a unified determination to reduce outputs and to recover supply – demand balance.

Table 1: Fiscal break-even oil price, asset reserves and public debt to GDP ratio of OPEC members

Countries	Fiscal breakeven price (USD/barrel)	Oil asset buffers (years)*	Debt-to-GDP ratio (percent)
Saudi Arabia	89	4,94	7
Iraq	78	0,02	76
Iran	61	5,41	16
UAE	70	55,66	19
Nigeria	74	0,07	12
Venezuela	87	0,02	53
Kuwait	50	No 2015 deficit	10
Qatar	36	No 2015 deficit	30
Libya	207	2,81	51
Algeria	100	2,09	10
Angola	57	1,40	57
Ecuador	86	No sovereign wealth funds	37

*Source: Stuermer & Dhaliwal (2015); *state wealth funds/state budget deficit.*

¹ According to EIA (2016a), the oil volume produced from OPEC in 2015 de facto was higher than the new ceiling, on average 31.64 mil barrels/day.

Table 2: Oil production cost by countries (USD/barrel)

	Marginal cost (2014)	Break-even cost
Saudi Arabia	5	22
Middle East Countries	5-17	38
Russia	30	40
Norway	N.A	52
Brazil	N.A	55
The USA (except shale oil extraction)	22	40
The USA (shale oil extraction)	33	58
Mexico	10	60
Venezuela	35	70-80
Nigeria	25	90

Source: Arthur D. Little (2015) and Morgan Stanley (2014))

In terms of market structure, fuels demand structure is highly competitive. If OPEC reaches a consensus, the supply side is in the high concentration (HHI index around 1900), OPEC can exert influences on oil price by output cut down (Table 3). Nevertheless, the disagreements among OPEC members can make the supply side fiercely competitive, as a result, it is ineffective to apply output reduction strategy to raise price but to rely on the low cost advantage. Output raise strategy is highly possible to be prioritized in the near future. Hence, supply-demand balance significantly depends on how long US enterprises maintain a high output level when oil price slips.

Table 3: HHI Index for liquid fuels market, Q1/2014 – Q4/2015

	Consuming nations	Producing nations (OPEC is counted as a producer)	Producing nations (separating OPEC members)
2014Q1	786,89	1879,95	441,31
2014Q2	792,73	1872,40	452,65
2014Q3	804,48	1885,60	454,43
2014Q4	808,16	1860,20	459,25
2015Q1	806,06	1872,33	468,07
2015Q2	798,00	1923,55	470,90
2015Q3	807,72	1919,96	470,23
2015Q4	800,19	1912,51	467,35

* $HHI = \sum_{i=1}^4 (Share\ of\ nation\ i)^2$, Share is counted as the percentage of Consumption /Production volume of 4 top producing countries. $HHI > 1800$: High concentration; $1000-1800$: Relatively concentration; < 1000 : High competition.

Source: Calculation of Authors from Goldman sachs (2015) and EIA (2016b)

Figure 4. Number of oil rigs of OPEC, Saudi Arabia and the USA, 2005-2015)

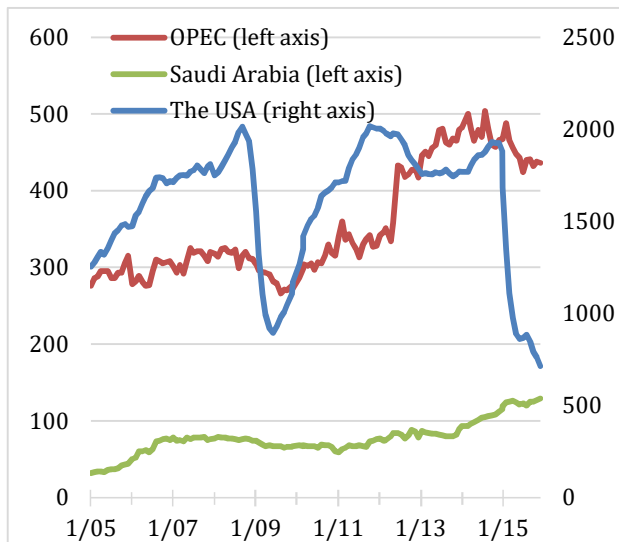
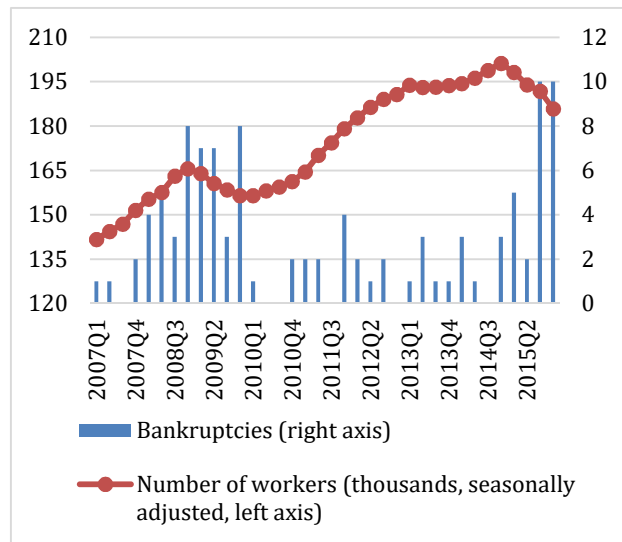


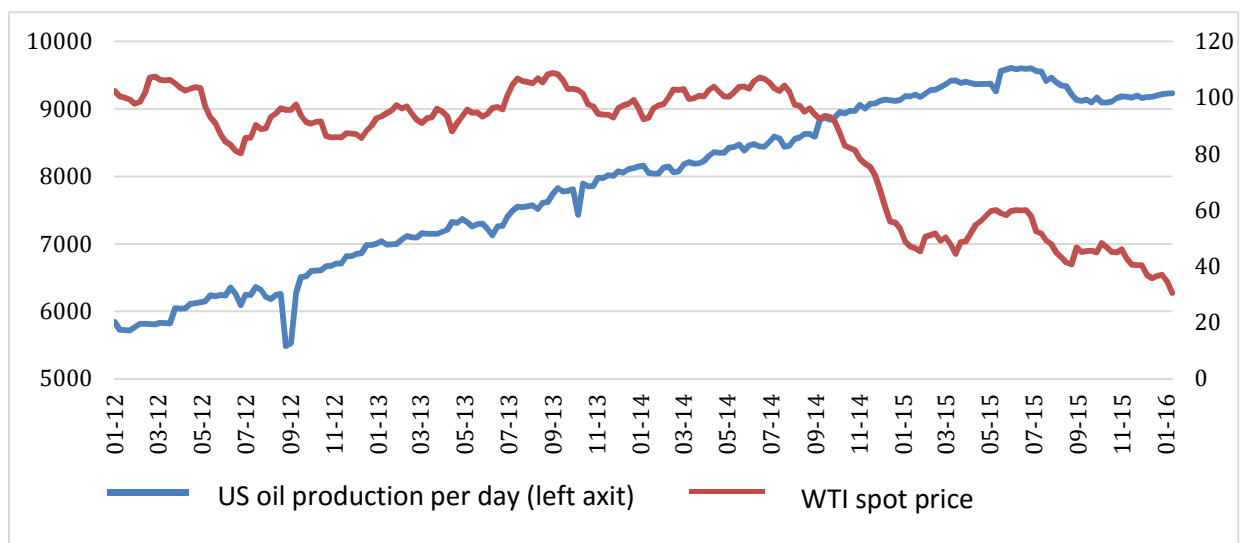
Figure 5. Number of bankrupt enterprises and number of workers in oil extracting industry in the USA



Source: Baker Hughes (2016), DallasFED (2015) and Bureau of Labour Statistics (2016)

The oil extracting industry in the USA has had signs of decline since the end of 2015 due to impacts of low oil price. While the quantity of oil rigs of OPEC members was stable, that of the USA experienced a three-time decline as compared to the beginning of 2015. In 2015, the number of bankrupt oil extracting firms in the USA in Q4 increased to 10 firms (Figure 5); accompanying a decrease in the number of workers in this industry of 7.7%, equal to about 15.400 people.

Figure 6. WTI price and exported crude oil volume of the USA, 06/01/2012 – 15/01/2016)



Source: EIA (2016a)

According to Mordan Stanley (2014), marginal costs of the USA firms which still use shale oil extracting technology are around at 33 USD/barrel; while long-term break-even costs of them are about 58 USD/barrel. Hence, the current crude oil price is nearly equivalent to the marginal cost level but far lower than the break-even cost level. In short term, these firms keep producing to remedy fixed costs but some will have to close down, which helps the oil market rebalance.

Although the slowdown sign in the USA oil production is apparent, the possibility and degree of a decline is not easy to predict. Crude oil volume of the USA fell slightly to 9.2 million barrels/day on 15th January 2016. According to EIA (2016a), the market will not reach a balance again until the beginning of 2017.

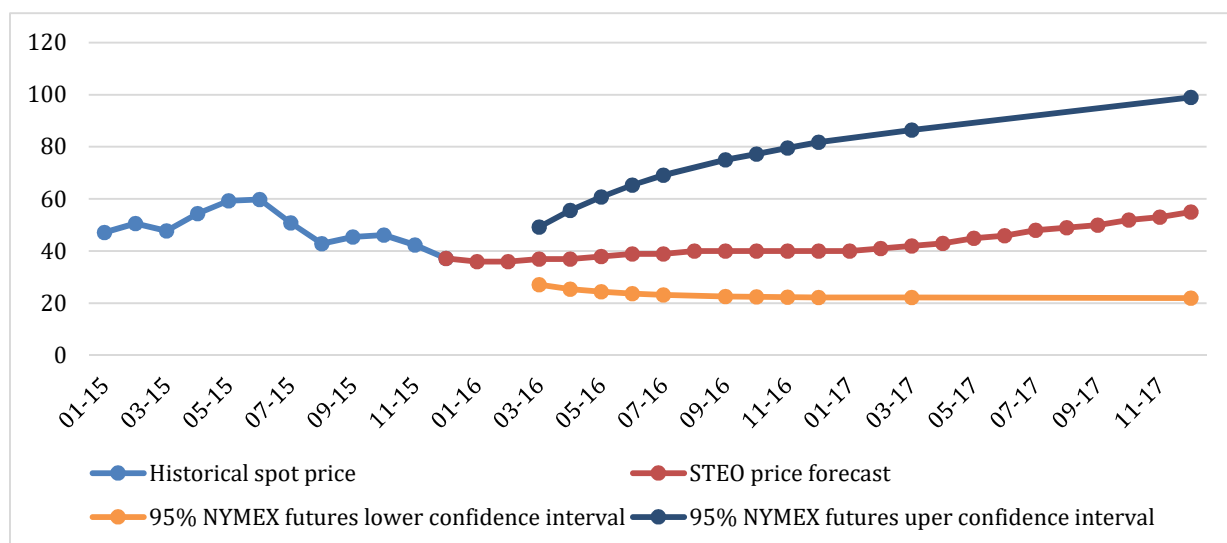
The world available storage capacity and oil price prospects in 2016

After 8 consecutive quarters of oversupply, liquid fuels reserves rose by 1.03 billion barrels. OECD itself shown an increase of 19 percent in oil reserves in the past 2 years, equal to 488 million barrels, reaching the level of 3.06 billion barrels (equivalent to 65 consumption days).

Based on estimations of Goldman Sachs (2015), the available storage capacity of OECD countries was around 127 million barrels in 12/2015, equal to 4.28% of the total reserve capacity. Possibly, the world capacity will affect oil price directly and periodically. When the world reserve ability runs out, accompanied by several consumption countries without the available storage, oil price will tend to slump to create an earlier supply – demand balance.

The continuous increase in the global liquid fuels reserves will pose great pressures on oil price. Oil price may stand still for a considerable time at the marginal cost of shale oil extraction of the USA (33 USD/barrel) to rebalance the supply and demand.

Figure 7. Forecast on WTI oil price of EIA 2016 – 2017 (USD/barrel)



Source: EIA (2016a)

According to EIA (2016a), the average Brent oil spot price in 2015 reached 52 USD/barrel. Based on predictions of pressures on the oil market, EIA estimated the average Brent and WTI oil spot price will plunge to 40 USD/barrel, down more than 10 USD/barrel as compared to 2015.

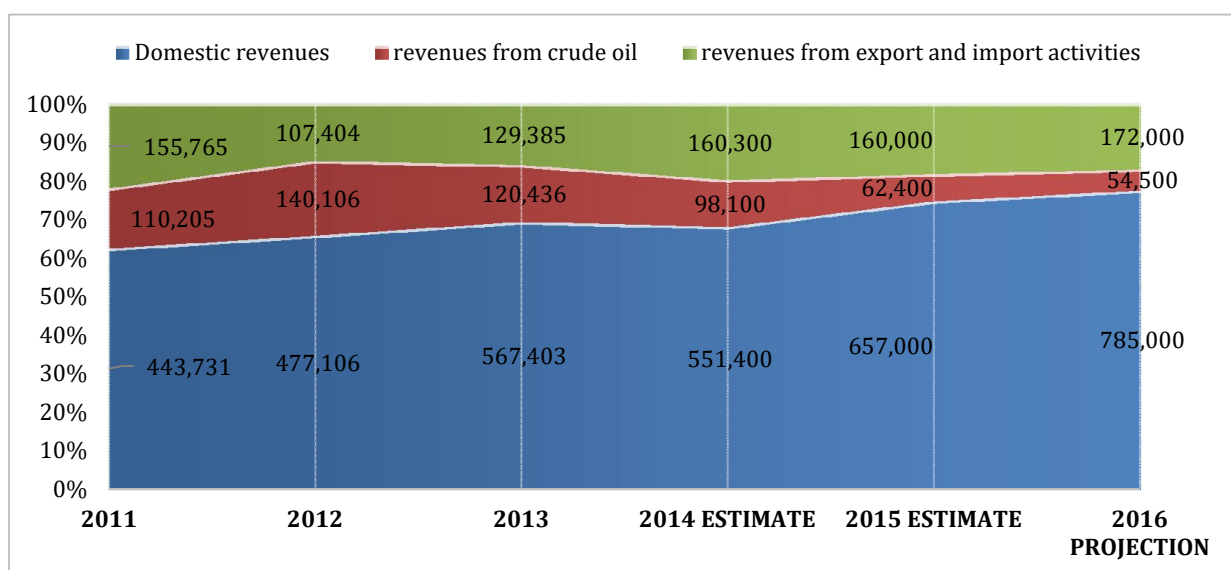
In case the slipping pace of the USA oil production is lower and the liquid fuels reserves soars more substantially than expectation, it is necessary for the oil price to have a plummet like 1998 to reach a balance in long term when it possibly stands at the average of 20 USD/barrel in 2016. A more positive prospect is feasible if the market reaches a balance sooner in 2016.

Impacts of global crude oil price on Vietnamese state budget revenue in 2016

Features of budget revenue from crude oil source of Vietnam

Although the proportion of state revenues from crude oil was shrinking in budget revenue structure, it has still remained as one of the major sources. According to General Statistics Office of Vietnam (GSO), budget revenues from crude oil to 15/12/2015 was 62.4 trillion VND, accounting for 7.1% total budget revenues. However, it only made up 67.1% of the projected number in 2015 which mainly resulted from a plunge in Brent crude oil price to the average of 52 USD/barrel in comparison to the projected 100 USD/barrel. According to 2016 Vietnam budget projection, budget revenues from crude oil will make up 5.4% of the total budget revenues, down 7.900 billion VND (yoy).

Figure 8. Structure of the three main budget revenue sources, 2011 – 2015 (billion VND)



Source: GSO, Ministry of Finance

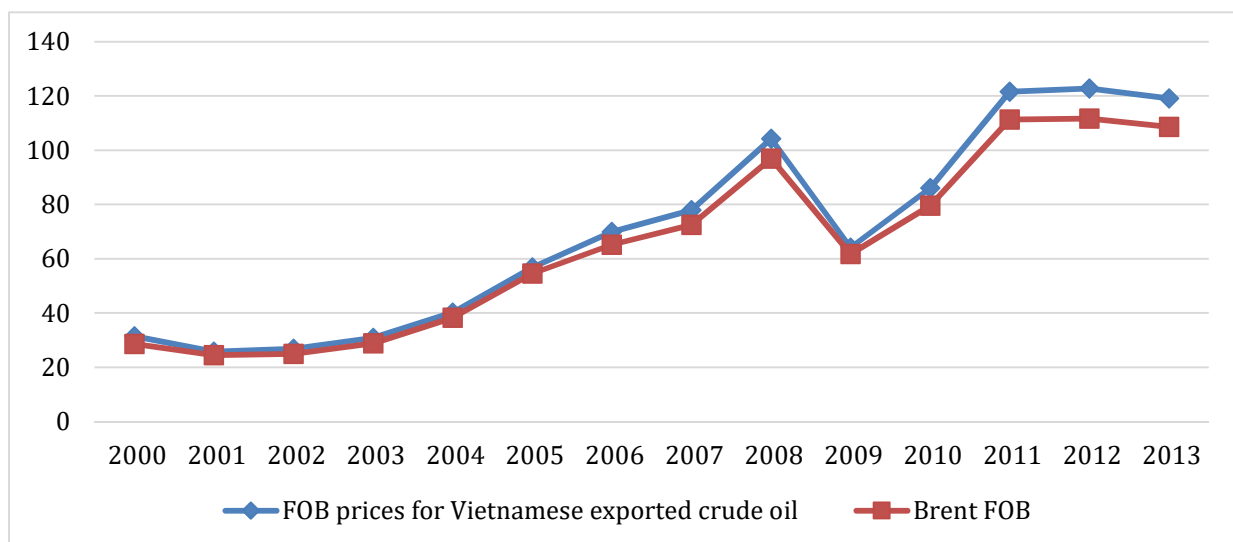
Methodology

Impact evaluation of oil price on state revenues is based on 2016 oil and gas exploitation plan of Vietnam Oil and Gas Group (PVN). Imports and exports volume of Vietnam in 2016 are estimated by structural equation with GDP growth rate and exchange rate being independent variables. The fall in crude oil prices will affect base prices to calculate some kind of taxes and profit of crude oil exploiting firms. As Vietnam only accounts for a small portion in the world total supply sources so it can be assumed that Vietnam oil exporting price is equal to and dependent on variations in the world oil prices (Figure 9).

Oil prices can affect budget revenue through three main channels:

+ *Revenues from crude oil export*: includes (i) export duty; (ii) natural resources tax and (iii) corporate income tax (CIT) from crude oil exploiting firms. To estimate the changes in budget revenues from crude oil, the research used the crude oil export tariff rate (code HS 29090010) in Vietnam tax schedule of 10%, the average natural resources tax rate for crude oil of 18%²; the average CIT rate for crude oil exploiting firms of 32%³; and the calculating method of these taxes from Circular 32/2009/TT-BTC. The research also uses the average crude oil exploiting cost of around 24.4 USD/barrel, equal to the cost when PVN exploited crude oil in 2015⁴. Besides exploiting and exporting crude oil, PVN also does business on other fields and these fields may not be directly influenced by oil prices so the CIT revenues in this research may not be equivalent to the real budget revenues from PVN.

Hình 9. Giá dầu thô trung bình xuất khẩu của Việt Nam và Brent FOB, 2000-2013 (USD/thùng)



² Resolution 712/2013/UBTVQH13 stipulates the rate is 7-29%.

³ Law on corporate Income tax 2008 stipulates the rate for exploration firms is from 32% to 50%.

⁴ <http://cafef.vn/vi-mo-dau-tu/tinh-hinh-tai-chinh-cua-pvn-se-ra-sao-khi-gia-dau-xuong-muc-30-usd-thung-20160109155439794.chn>

Source: The authors' calculation from CEIC, EIA

It should be noticed that since the natural resource tax on crude oil production is computed on the absolute output volume so this revenue source is not affected by changes in prices.

+ *Revenues from petrol and oil import*: The research estimates revenues changes from import duty (20% for engine petrol, applied since 22/05/2015⁵) and special consumption tax (10% for petroleum⁶). Since profit and environment protection tax are computed on import volume, changes in oil prices do not impact revenues from these sources.

+ *Revenues from value added tax (VAT)*: The fall in oil prices is favourable for economic growth and increases budget revenues from VAT. The research is based on VNU-CEG model to estimate changes in nominal GDP as well as changes in this revenues source stemming from a fall in oil prices. The research also assumes average VAT rate in 2016 equal to 2015 and standing at 6.6%⁷. The assumption makes sense as VAT rates of Vietnamese commodities are around 0-10%. Notably, VAT on domestic crude oil consumption is not separately calculated as it is included in the total VAT revenues calculated by VNU-CGE model.

Above are three revenue sources directly affected by changes in crude oil prices. Changes in revenues from natural resources tax and CIT from Vietnamese oil refineries are excluded in the research. Moreover, other domestic revenue sources, i.e. corporation income tax, personal income tax revenue... will also bear influences of oil prices; nonetheless, these influences affect indirectly, have lags and depend largely on economic structure and flexibility.

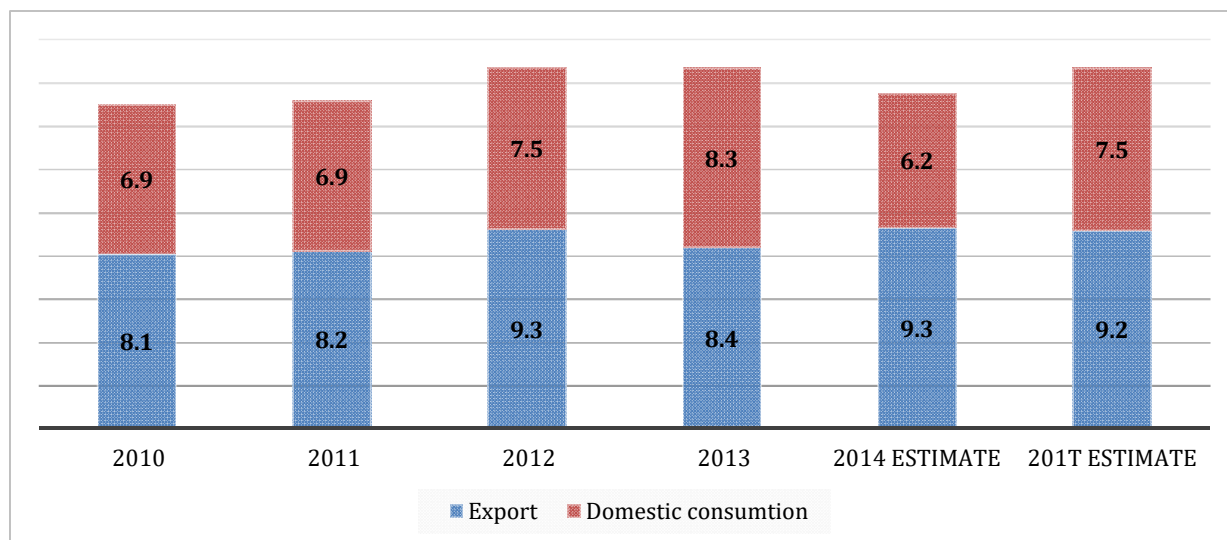
The ratio of domestic consumption volume to export volume in crude oil in 2016 is assumed to be unchanged compared to 2015 (Figure 10). Since changes in oil prices do not directly affect the marginal profit of oil filtration when prices of outputs such as petrol, diesel oil and fertilizers... follow the same trend of crude oil prices, domestic consumption for crude oil is assumed not to affect PVN profit.

⁵ Circular 78/2015/TT-BTC.

⁶ Law on special consumption tax 2008.

⁷ The average VAT is equal to VAT revenues/nominal GDP excluding VAT. The source of data is CEIC. Calculations of the authors shows that the average VAT rate of Vietnam in 2009-2013 was also at 6.6%.

Figure 10. Vietnamese crude oil output distribution by consumption markets, 2010-2015 (million ton)



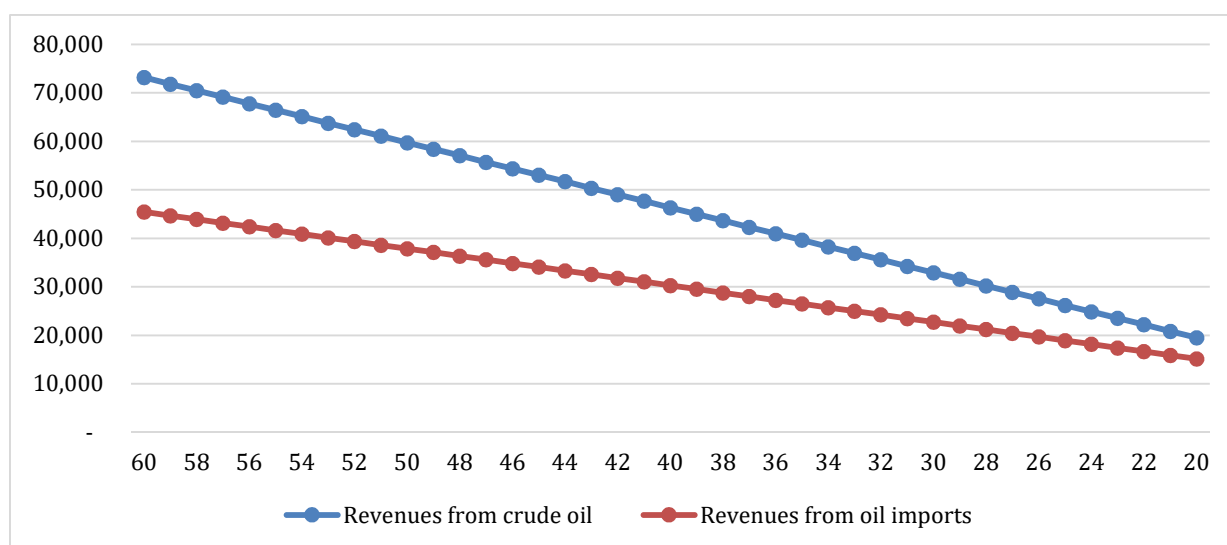
Source: The authors' calculation from GSO, MOF

VND/USD exchange rate is based on the scenario of a 3% increase in 2016. Finally, due to restrictions in information access, calculation in this research is combined with supposedly reasonable assumptions, which may not be absolutely accurate or reflect real changes.

Results

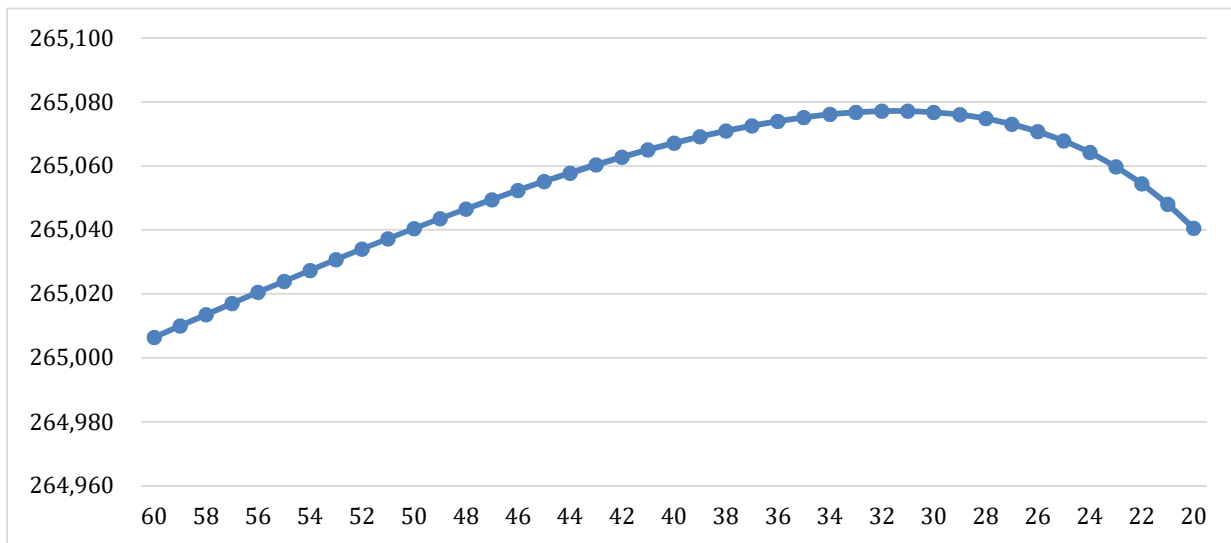
The research covers changes from 20 to 60 USD/barrel of the average crude oil prices in 2016. Results show that budget revenues from crude oil (including import duty, natural resources tax, corporation income tax, exploitation fee).

Figure 11. Budget revenues by different oil price scenarios (billion VND)



Source: Calculation of the authors

Figure 12: Revenues from VAT by different crude oil price scenarios (billion VND)

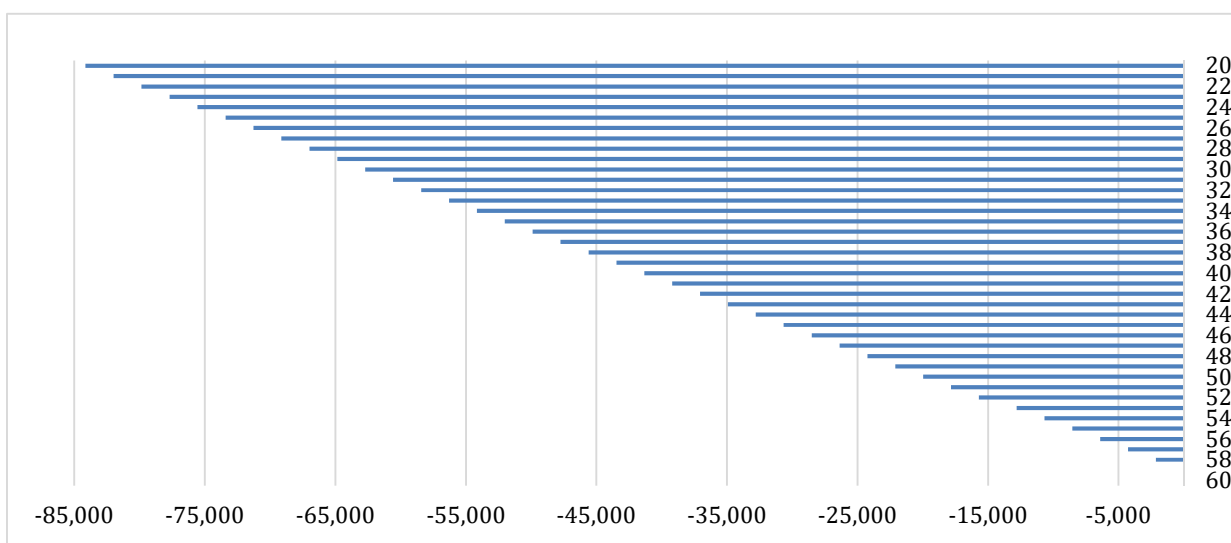


Source: Calculation of the authors

In average, crude oil prices fall by 1 USD, budget revenues from crude oil will in turn drop by 1.400 billion dong. Similarly, state budget from oil imports also suffers from the falling oil prices. Estimation shows that when crude oil price lowers by 1 USD, budget revenues from oil imports will slip approximately by 760 billion dong (Figure11).

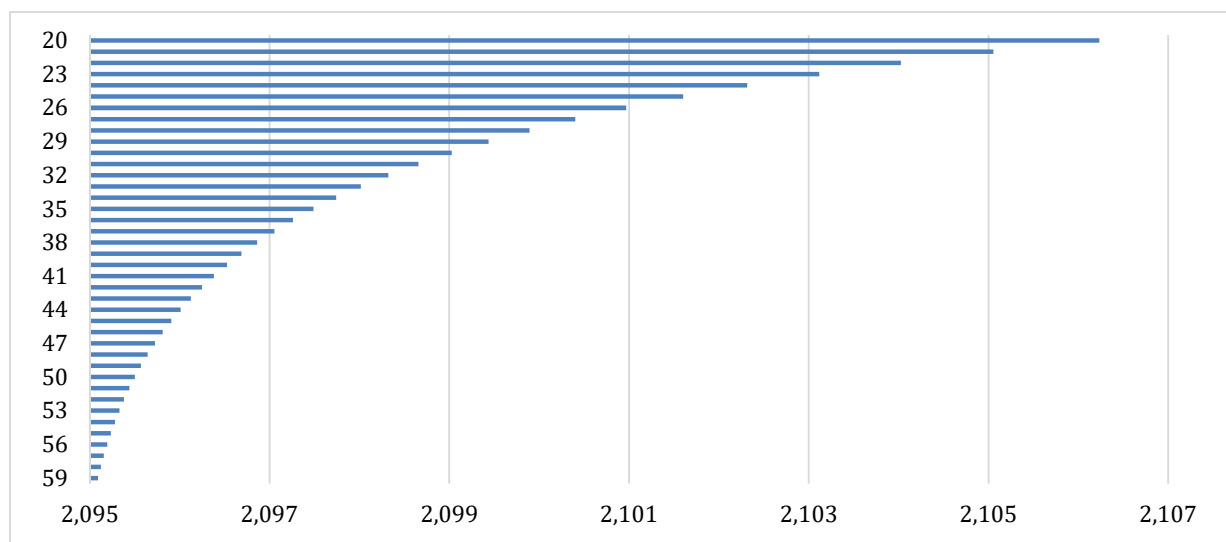
The relation between oil price and VAT revenues indicates a nonlinear relationship. VAT revenues peaks at 32 USD/barrel and tends to decline if oil prices continue to plunge.

Figure 13 : Changes in budget revenues by different crude oil price scenario compared to 60 USD/barrel scenario (billion VND)



Source: Calculation of the authors

Figure 14: Changes in budget revenue when crude oil price lowering by 1 USD/ barrel by different level of prices (billion VND)



Source: Calculation of the authors

In general, impacts of slumping crude oil prices are quite severe on budget revenues. If the average crude oil price is at 40 USD/barrel according to EIA forecast scenario, state budget will slip by more than 40.000 billion VND in comparison with the assumption level for 2016 of 60 USD/barrel. If the average price is around the current level of 32 USD/barrel in 2016, the slip expands to nearly 60.000 billion dong. In the worst situation when the price goes down to 20 USD/barrel, the state budget can decrease by nearly 85.000 billion VND. Notably, the marginal budget decrease tends to be higher when oil price is at low level (Figure 14).

Conclusion and policy implications

The global crude oil market is witnessing complicated changes. Rising market pressures from OPEC are accompanied by Chinese and emerging countries' economy prospects evolving worse. The speed of exploitation volume adjustment of the US is still questioned by analysts. However, positive scenarios show the crude oil price will get lower in 2016 and farther than the average expected price of 60 USD/barrel of Vietnamese agencies responsible for projecting the budget revenue.

Based on accessible information and supposedly reasonable assumptions, this research assessed impacts of oil prices on state budget revenues in the range from 20 to 60 USD/barrel. The results show that with a one-dollar decrease in oil price, budget revenues will lower about 2.100 billion VND on average. Hence, when there are no optimistic alterations in oil market, oil price will still be less than 40 USD in 2016, which will significantly affect state budget revenues.

It alerts a repetition of difficulties of the government in reaching a fiscal balance occurred in 2015. We recommend that the state budget projection activities should be based on reasonable

scenarios to avoid risks in fiscal disciplines. The unfavourable trends of the global crude oil market in 2016 are posing great pressures on the projected budget deficit of lower than 5% GDP. This target requires strong reforms and policy determination to cut down budget expenditure, especially the current expenditure which recently increased uncontrolledly.

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Disclosure appendix

Author's Certification

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Additional disclosures

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