Rabobank

The oil market in turmoil: a case of losers and winners

Special

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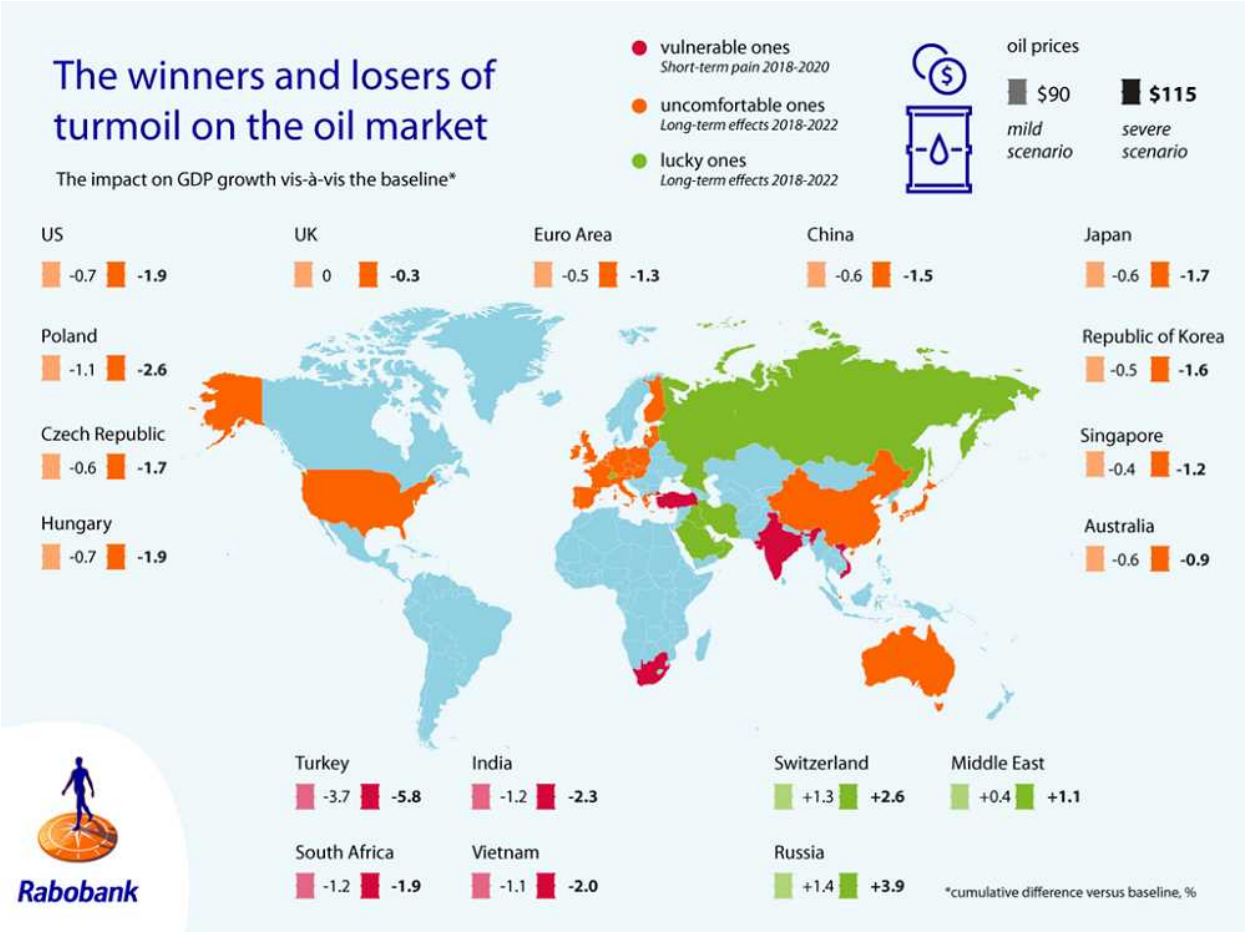
- **The current surge in oil prices is mainly related to supply-side factors, such as the extension of the OPEC agreement to curtail supply, bottlenecks in Venezuelan petroleum production and the US withdrawal from the Iran Nuclear Deal**
- **Our official Rabobank forecast is that oil prices will come down from current highs and flatten throughout the year. The expected increase in oil demand and production cuts will be met by higher onshore production in North America. Moreover, Saudi Arabia and Russia have recently signaled to gradually step up production in the second half of 2018**
- **However, geopolitical stress following from, for instance, the re-election of President Maduro in Venezuela and anticipated US announcements to economically quarantine Iran could disrupt the oil market in the near future and result in renewed oil price volatility**
- **We use the macro-econometric model NiGEM to assess the impact in two oil price scenarios on different economies in the world. In a *mild* scenario, oil prices climb to USD 90 per barrel for some quarters. In a *severe* scenario, prices rise to USD 115 per barrel and remain around that level until 2022. Our results show that global growth will slow in these scenarios by 0.4ppts-0.9ppts between 2018-2022. The economic impact is however very unevenly distributed between countries, but can best be distinguished between three different groups of countries: the vulnerable ones, the lucky ones, and the uncomfortable ones**
- **The vulnerable ones are net oil importing emerging markets like India and Turkey that experience short-term pain in case of a swift rise in oil prices, but recover somewhat from initial blows. In our severe scenario, Turkey is the only country that will end up in recession, with expected GDP growth of -0.5% in 2019**
- **The lucky ones are oil exporting countries that benefit from a rise in oil prices, e.g. Middle East and Russia. Russia experiences a goldilocks trajectory in especially the severe scenario, combining relative low inflation below 5% with very high economic gains (6.8% in 2019)**
- **The uncomfortable ones are net oil importing countries facing moderate losses, for example the US and Eurozone. The US, the world's largest oil importer after China, loses 1.9ppts of GDP growth up till 2022 in our severe scenario, which equals almost USD 500bn**

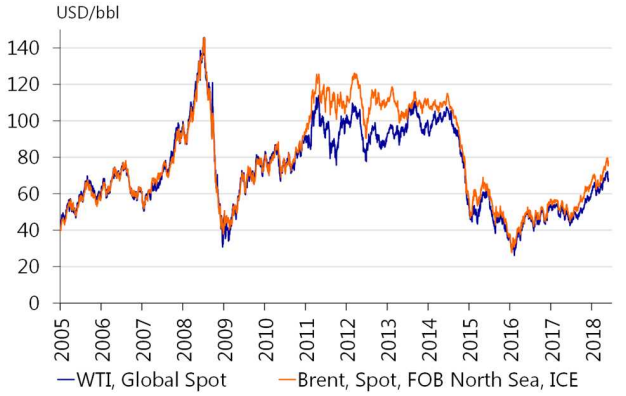
https://economics.rabobank.com/publications/2018/june/the%2Doil%2Dmarket%2Din%2Dturmoil%2Dlosers%2Dand%2Dwinners/



Introduction

Since mid-2017, oil prices have risen substantially (figure 1). Brent was even pushed towards USD 80 per barrel (bbl) after the Trump administration announced a withdrawal from Joint Comprehensive Plan of Action (JCPOA or Iran Nuclear Deal) on 8 May. Moreover, if global geopolitical tensions were to continue to rise in 2018, we can expect more volatility in oil prices as well. For the global economy, rising oil prices can be interpreted as a cost-enhancing form of monetary tightening, which is happening in parallel to a drain of global US dollar liquidity due to tighter monetary policy by the Fed. In 2015, we elaborated on the impact of falling oil prices for the global economy (see Hayat, 2015) and the causes behind the price drop (Dumitru, 2015). In this Special, we examine the opposite: we assess the current rise in oil prices and especially what would be the economic damage in case crude prices continued their steep upward trajectory. In order to assess the global economic impact in two oil price scenarios, we use NiGEM, a macro-econometric world trade model that is well equipped to run oil price supply shocks.

Figure 1: Brent almost touched USD 80 per barrel



Source: Macrobond, Rabobank

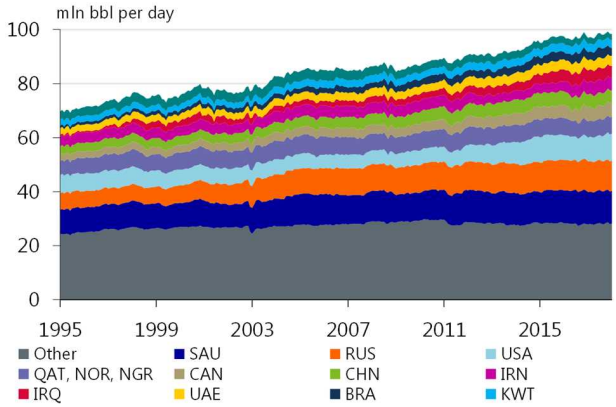
What is causing the rise in petroleum prices?

Mechanisms

Oil prices are subject to three factors: demand, supply and financial market expectations (Kaufmann, 2011). The demand for oil is mainly determined by economic growth and energy intensity of consumption, while supply of oil is affected by fundamentals such as shocks to production capacity, oil reserves or geopolitical risks and factors that have an impact on prices by altering the responsiveness of supply, such as the market structure, economics of exploration and technological progress (see Dumitru, 2015). To give an example, the oil sector has invested heavily in developing new technologies to extract hydrocarbons from shale layers in the US, which explains why the US has expanded its oil supply from 2010 onwards to a considerable extent (figure 2).

Oil prices are not only determined by supply and demand of oil, but to an increasing extent by financial market expectations. After the turn of the century, trading in financial oil-related instruments has increased markedly. On the one hand, oil producers can hedge their position against future oil price declines, which results in a more stable market. At the other end of the spectrum, traders can take positions in the oil market and earn money from speculation, which generally results in more volatility. There is general consensus that financial market trading in oil-related products has exacerbated oil price volatility. Moreover, market expectations on future oil supply and demand shocks have a significantly large impact on the current oil price. This explains why news on the geopolitical front causes oil prices to respond almost instantly.

Figure 2: Contribution to global oil supply



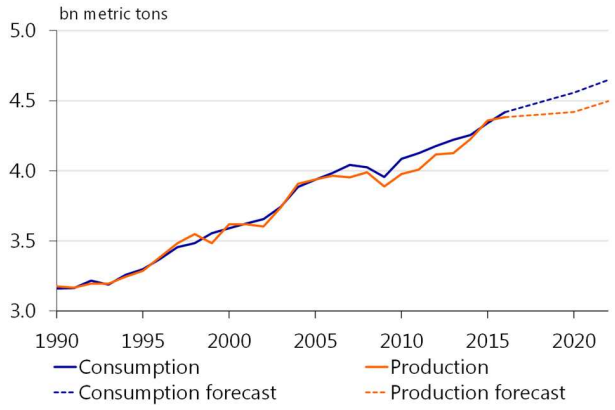
Source: Energy Information Administration (EIA), Macrobond, Rabobank.

Explanation: BRA = Brazil, CAN = Canada, CHN = China, IRN = Iran, IRQ = Iraq, KWT = Kuwait, MEX = Mexico, NGA = Nigeria, NOR = Norway, QAT = Qatar, RUS = Russian Federation, SAU = Saudi Arabia, UAE = United Arab Emirates

Current surge in oil prices

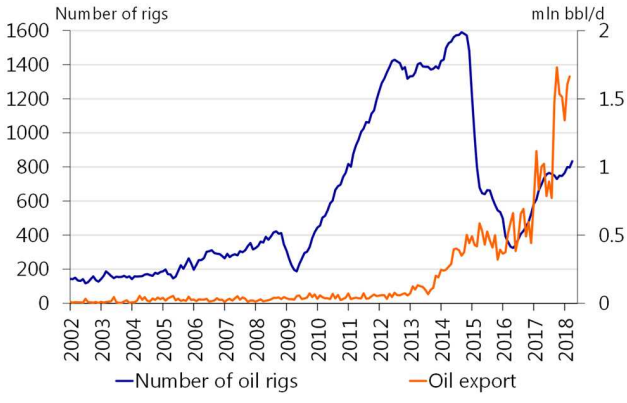
With levels of 4.4bn metric tons in 2016, oil production and consumption were on par. However, expectations by BP are that production will increasingly fall short vis-à-vis increasing consumption needs and the oil market will continue to be tight in upcoming years (figure 3).

Figure 3: Global oil production and demand



Source: Energy Information Administration (EIA), BP, Macrobond, Rabobank

Figure 4: US production has picked up



Source: Macrobond, EIA, JODI oil database, Rabobank.

Note: the large drop in oil rigs in 2015 is the result of lower oil prices, which sharply reduced the profitability of shale oil

With respect to the recent developments, the IMF (2018) argued in its latest World Economic Outlook that 80% of the surge in oil prices that we have seen since mid-2017 can be attributed to supply-side bottlenecks. The global economic expansion which has propped up demand for oil has only pushed up prices for the remaining 20%. The supply-side bottlenecks that the IMF identifies are threefold. First, the OPEC agreed to extend the agreement to limit the supply of oil to the end of 2018, which means that supply is cut by 1.2 mln barrels per day (bbl/d) compared to October 2016 production levels. Moreover, Russia has also agreed to stick to current levels, which squeezes supply by another 0.6 mln bbl/d compared to October 2016. Second, there were some unforeseen events constraining the supply of oil. Venezuela is facing increasing macroeconomic and financial headwinds and unexpectedly cut production of crude oil to a substantial degree. In addition, there were production problems in Libya and the North Sea. Third, the US was not able to respond to the squeeze in supply by stepping up its shale production due to Hurricane damage to oil drilling infrastructure. Recently, however, the US rig count and oil export have been picking up in response to rising oil prices (figure 4).

New geopolitical turmoil could push up oil prices

Our official Rabobank forecast is that oil prices will come down from current highs and flatten throughout the year (see our Monthly Outlook and Quarterly outlook: offshore energy): the expected increase in oil demand and production cuts will be met by higher onshore production in North America. Moreover, upstream capex spending has recovered in 2017 on the back of lower break-even oil prices and is expected to pick up in the years ahead, but these only have a positive impact on available capacity with a certain time lag. Moreover, Saudi Arabia and Russia have recently signaled that they are willing to step up the oil production in the second half of 2018 in order to calm the markets (see Bloomberg).

There is a possibility, however, that a series of new US foreign policy announcements in the upcoming period will raise political tensions with a number of important global oil suppliers. First and foremost, on 8 May President Trump gave an 18 minute speech, where he announced a withdrawal from the Joint Comprehensive Plan of Action (JCPOA). This Plan is better known as the Iran Nuclear Deal which was signed in 2015 by the US together with the United Kingdom, France, China, Russia and Germany. The withdrawal of the US from the deal means that the US will be re-imposing all pre-deal sanctions on Iran and firms have a horizon of 90 or 180 days to reduce their exposure. Moreover, on 21 May, US Secretary of State Mike Pompeo provided more information how the US is going to tighten the screws on the Iranian regime in the next couple of months. What became clear is that the US will push on with heavy secondary sanctions within six months and the US will crack down on European allies that continue to trade and invest in Iran. Pompeo's speech at least underlines that we can expect more oil price volatility in the next couple of months. Besides dynamics on the Iran deal, Venezuelan President Maduro of the PSUV was re-elected on 20 May for another six-year term. His re-election will add to political turmoil in Venezuela that has started over one year ago and has resulted in a humanitarian crisis and a collapse of the economy. One day after the election result, President Trump signed an executive order which raised US sanctions on Venezuela. The US penalties are a response to what the vice president Pence called an "illegitimate result of this fake process". However, the sanctions do not include sanctions on the import of Venezuelan oil. According to the US statement, this would cripple the Venezuelan people and harm US interests. But if tensions continue to rise and new sanctions on Venezuelan oil would be imposed, this again is expected to affect oil prices.

In short, geopolitical developments in the near future could disrupt the oil market and result in renewed oil price volatility. The question is what would be the global economic impact in case oil prices would be pushed to even more elevated levels.

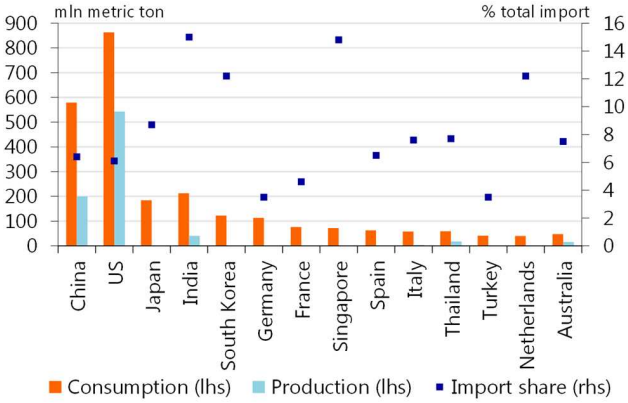
What is the economic impact of higher oil prices?

In a Special report by Rabobank dating back from 2015 (see Hayat, 2015), we assessed which countries would

benefit from the drop in oil global prices throughout 2015. The main conclusion in that report was that net oil consuming countries are likely to gain more from a drop in oil prices than the net producers will lose, so reversely a rise in oil prices would mean bad news for the global economy.

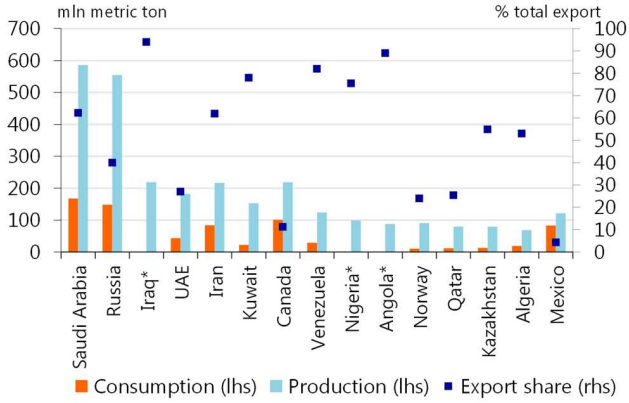
The economic impact is very unevenly distributed between countries. The most vulnerable countries are the net oil importers that have a large share of energy in their total consumption basket (figure 5), which is the case for many emerging markets. In these economies, a rise in oil prices leads to a deterioration of the current account, higher portfolio outflows which puts downward pressure on currencies and lower purchasing power due to higher inflation.

Figure 5: Top 15 net oil consumers



Source: BP, Macrobond, OEC, Rabobank

Figure 6: Top 15 net oil producers



Source: BP, Macrobond, OEC, Rabobank

According to these metrics, especially Japan, India, South Korea and Singapore are vulnerable to a rise in oil prices. However, if we take into account the historic relationship between the Japanese yen and Singapore dollar and oil price shocks, we might register capital inflows in these countries. These inflows will mitigate any substantial downward pressure on their currency and, consequently, prevent an extensive deterioration of the terms of trade.

For net oil exporters, the economic picture is completely the opposite. High oil prices tend to provide relief in countries that largely depend on these commodities, resulting in higher government revenues, an improvement of the current account and bolstering foreign currency reserves. The Middle East, Africa and Russia most likely will see their external positions improve markedly, although the positive impact on Venezuela and Russia is weakened by US economic sanctions.

The next question is: what would be the impact of a further rise in oil prices? In order to answer this question, we run two scenarios with macro-econometric trade model NiGEM.

Scenario analyses

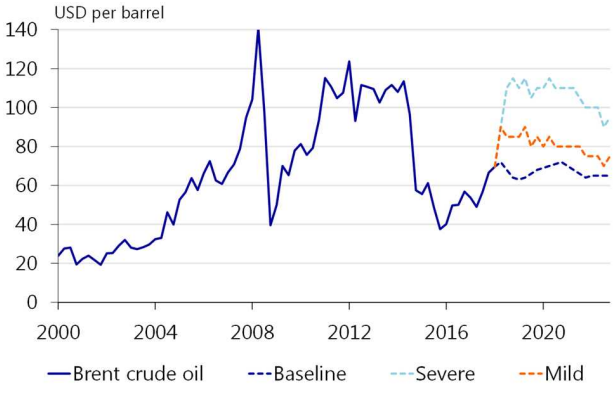
NiGEM

We use the macro-econometric model NiGEM to assess the effect of two oil price scenarios on different economies in the world. Oil prices affect economies in NiGEM in three different ways (see Annex II for more information). First, higher oil prices reduce trade between counties, as import and export prices are shored up. Second, a higher oil price feeds into higher inflation, which lowers real disposable income of households and, consequently, weighs on private consumption of households. Finally, potential output is affected negatively due to less usage of oil inputs in total production.

In our *mild* oil price scenario, we assume that the oil price will continue to climb to USD 90 per barrel in Q2 of 2018 on the back of geopolitical turmoil (figure 5). After remaining elevated for a couple of quarters, it will gradually come down to USD 80 per barrel. In our *severe* scenario, prices are being pushed up to USD 115 per barrel late 2018 and we see a sharp pullback of oil prices only after 2022. Besides a rise in oil prices, we expect the exchange rates of net oil importing countries to depreciate, except for several majors, which will experience capital inflows on the back of safe haven behavior. Finally, we will expect vulnerable net importing emerging markets to face higher investment premiums, which will raise the user costs of capital, and will weigh on private investment. We saw similar developments during *taper tantrum* in 2013, which propped up spreads of credit default swaps (CDS) considerably. For all assumptions we refer to Annex I.

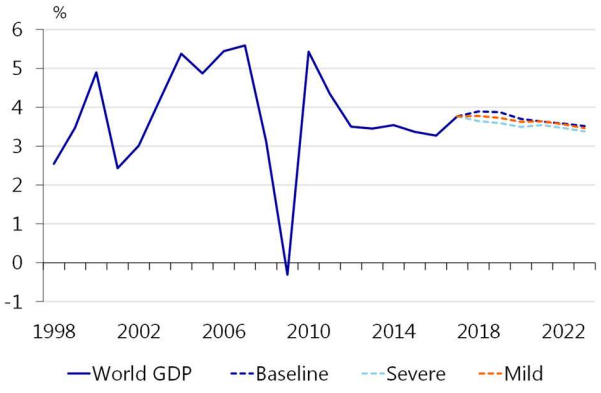
We compare the scenarios against the baseline, which is the RaboResearch forecast described in the Economic Quarterly Bulletin of March 2018 supplemented with recently published data and new insights regarding the oil price, interest rates and currencies. In our baseline one barrel of Brent oil costs 72 US$ in the second quarter of 2018, after which it slightly decreases to 68 US$ and 64 US$ in respectively the third and fourth quarter of this year. Our long-term forecast of the oil price remains unchanged compared to our March forecast.

Figure 7: A mild and severe scenario for the oil price



Macrobond, Rabobank

Figure 8: Cumulative global GDP loss in case of a severe oil supply shock is 0.9ppts



Source: Macrobond, NiGEM, IMF, Rabobank

Results

Our results show that, in general, global growth will slow as a result of higher oil prices. In our mild scenario, the world loses out on 0.4ppts of economic growth between 2018-2022 and in our severe scenario global economic losses would end up being 0.9ppts in total (figure 8). The global losses are limited as the impact on net oil producers and consumers are cancelling each other out to some extent. Beneath the relatively smooth surface, however, there is much more turbulence to be found for individual countries (table 1).

Table 1 shows three economic outcome variables for a selected number of countries over the period 2018-2022: 1) *GDP*, 2) *inflation* and 3) *the GDP contribution of net trade* (i.e. export minus import). In the first column, we show the cumulative difference of GDP growth vis-à-vis our baseline. If we pick China as an example, the effect on GDP growth in our severe scenario shows a figure of -1.5%. This means that in our severe oil scenario, China loses 1.5ppts of GDP growth up till 2022 compared to our baseline. In the second column we report the peak in inflation, which in the case of China is 3.6% in the severe scenario. The third column shows the cumulative contribution of net exports to GDP growth compared to our baseline. In the case of again China, the total growth contribution of net export (export minus import) is 0.6 percentage points higher than in our baseline. This is due to a faster decline in Chinese imports compared to exports vis-à-vis the baseline, as import prices rise faster than export prices.

Table 1: Scenario results short term: 2018-2022

Countries		GDP growth *Cumulative difference versus baseline, ppts*		Inflation *Peak*		Net export *Cumulative difference of growth contribution versus baseline, ppts*	
		Mild	Severe	Mild	Severe	Mild	Severe
Vulnerable ones	India	-0.7	-1.9	8.1	9.2	0.2	0.5
	South Africa	-0.9	-1.8	6.5	8.3	0.0	0.2
	Turkey	-0.7	-1.5	11.0	11.4	0.9	1.7
	Vietnam	-0.2	-0.6	11.6	11.6	0.5	0.6
Uncomfortable ones	Australia	-0.6	-0.9	2.2	2.4	0.2	0.5
	China	-0.6	-1.5	2.5	3.6	0.2	0.6
	Czech Republic	-0.6	-1.7	2.3	2.5	0.8	1.2
	Euro Area	-0.5	-1.3	2.0	2.7	0.4	0.8
	Hungary	-0.7	-1.9	3.3	3.6	1.7	2.1
	Japan	-0.6	-1.7	1.2	1.5	0.2	0.5
	Netherlands	-0.5	-1.2	2.7	3.3	0.4	0.9
	Poland	-1.1	-2.6	3.4	3.7	0.9	1.2
	Singapore	-0.4	-1.2	2.2	2.4	-0.5	-1.7
	Republic of Korea	-0.5	-1.6	3.4	3.9	0.6	1.6
	United Kingdom	0.0	-0.3	3.8	3.6	0.3	0.6
	United States	-0.7	-1.9	2.5	2.8	0.2	0.4
Lucky ones	Russian Federation	1.4	3.9	4.3	4.7	-0.7	-2.1
	Switzerland	1.3	2.6	2.3	1.3	-1.7	-4.5
	Middle East	0.4	1.1	9.4	13.7	-1.0	-2.3
	World	-0.4	-0.9			-	-

Source: NiGEM, Rabobank

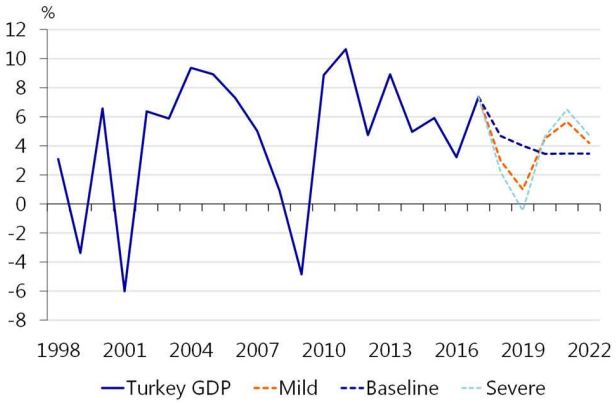
From Table 1, we can make a distinction between three different groups of countries:

1. *The vulnerable ones*: net oil importing vulnerable emerging markets experiencing short-term pain due to a swift rise in oil prices, but recover somewhat from initial blows. These countries are: India, Turkey, South Africa and Vietnam
2. *The lucky ones*: countries that benefit from a rise in oil prices, e.g. Middle East, Russia and Switzerland
3. *The uncomfortable ones*: net oil importing countries that face moderate losses: e.g. OECD countries, China and developed Asian countries (Singapore and the Republic of Korea)

The vulnerable ones

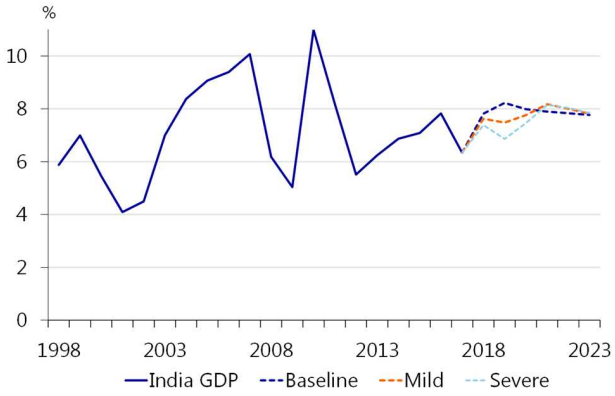
The first group of countries is the most vulnerable to a fast rise in oil prices and consists of net oil importing emerging economies, such as India, Turkey, Vietnam and South Africa. These countries experience a relatively heavy depreciation of their currencies, a swift rise in investment premiums, a spike in inflation and a substantial blow to the economy in the short term. Table 1 masks the short-term pain that these countries experience, as these countries also show a quite steep recovery of growth after the initial pain has petered out. GDP trajectories of Turkey and India illustrate this specific pattern well (Figure 9 and 10).

Figure 9: Turkey is the only country that would end up in recession in our severe oil scenario



Source: Macrobond, NiGEM, Rabobank

Figure 10: In a severe oil scenario India could lose out on 2.3ppts of growth in the short term



Source: Macrobond, NiGEM, Rabobank

Turkey would face a massive blow to its economy in case oil prices would continue to rise. Our calculations show that these GDP losses against the baseline could end up being as large as -7ppts in 2018 and 2019 together. In the severe scenario, Turkey would hit recession territory: -0.5% GDP growth in 2019.

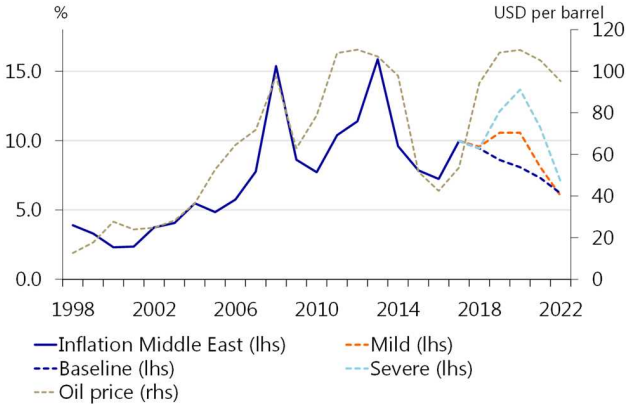
Being the world's fourth net oil importer, India is also one of the most vulnerable countries to an oil shock. Higher oil prices lead to higher import prices and a deterioration of the current account deficit, which in India already hit a multi-year high in 2017. Weakening current account metrics put pressure on capital outflows, whereas India is also prone to portfolio outflows caused by further tightening of USD liquidity by the Fed (see Erken, Hayat and Heijmerikx, 2018). All in all, higher oil prices would result in a 12% depreciation of the INR in our severe scenario, raising import prices to even more elevated levels. Although India's external sector would benefit from a weakening INR, the Indian economy overall would end up being worse off by 1.2ppts (mild) and 2.3ppts (severe) up to 2020. This is equal to INR 433bn and INR 860bn of missed growth, respectively. The Indian economy would make up for some of these losses after 2020, but ultimately the long-term damage would still end up being in the range of INR 300bn-500bn (USD 5 to 8bn). Such an impact would certainly bring back memories of the demonetisation impact of last year.

The lucky ones

As expected, the beneficiaries from rising oil prices are the net oil exporters. In our calculation these are for instance African countries (e.g. Angola, Nigeria and Algeria, not shown in Table 1), the Middle East and Russia. In the Middle East, however, the effects are not very straightforward and the economic gains up till 2022 are rather limited: 0.4ppts in the mild scenario and 1.0ppts in our severe scenario. Domestic demand in the Middle East would flourish, but to a lesser extent than for example in Russia, due to relatively high inflation (which in our scenarios may already be underestimated, see figure 11). This is partly because some countries in the Middle East import oil and thus face import inflation. In addition, inflation shoots up because we do not expect the currencies in the Middle East in general to appreciate, with the consequence that the Middle East, unlike Russia, does not benefit from lower import prices and only to a lesser extent from higher earnings from additional export.

A country that would experience a goldilocks situation from a rise in crude prices is the Russian Federation, combining relatively low inflation (below 5%) with very high growth in especially (6.8% in 2019). Over the entire projection horizon, our model outcome shows that Russia would gain 1.4ppts in our mild scenario and 3.9ppts vis-à-vis the baseline in our severe scenario, with domestic demand growing by 2.1ppts and 6.1ppts (against the baseline), respectively. The combination of a strengthening Ruble and high export prices results in low inflation (in the short term) and high earnings from export, both boosting domestic demand. After 2020 inflation picks up again due to a positive output gap and higher export prices of Russia's most important trading partners. Moreover, the earnings from export decrease due to base effects in the appreciation of the Ruble and the increase in oil prices.

Figure 11: Heavy inflation in the Middle East and rising oil prices go hand in hand



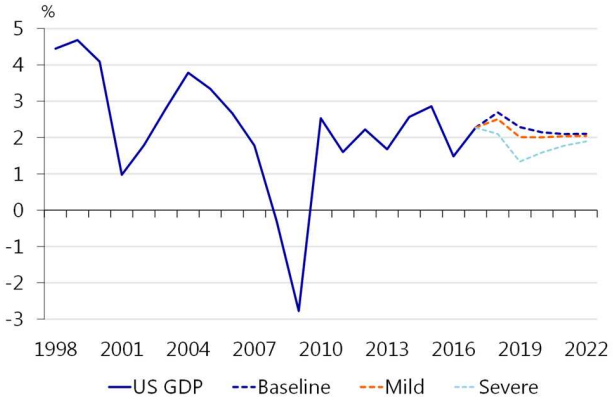
Source: NiGEM, Rabobank

Switzerland would also benefit from a rise in net crude. The CHF appreciates to a substantial degree due to safe haven investment flows. The strengthening of the Swiss franc pushes down import prices, which even results in quite substantial deflation and a boost of private consumption.

The uncomfortable ones

The third and final group are the uncomfortable ones: net oil importing countries that would face moderate losses in our oil scenarios. An important one is, of course, the US. In our severe oil scenario, the US loses 1.9ppts of GDP growth up till 2022, which is equal to 0.4ppts per year (figure 12). Given the level of GDP in 2017 of USD 17trn, the US would lose out on USD 130bn of value added up to 2022 in our mild oil shock scenario and almost USD 500bn in our severe scenario. The fact that the US experiences relative heavy losses is because, after China, the US is the largest net oil importer in the world (figure 5). As a result, the considerably higher oil prices in our scenarios translate directly into higher producer and consumer prices, which results in downward pressure on the competitiveness of export products and private consumption. Although less imports due to higher import prices and less domestic demand partially offset these negative effects on GDP, the overall impact on the US remains substantially negative. This also explains why the US from a macro economic standpoint is keen to dampen oil supply shocks by firing up the engine on the shale drilling.

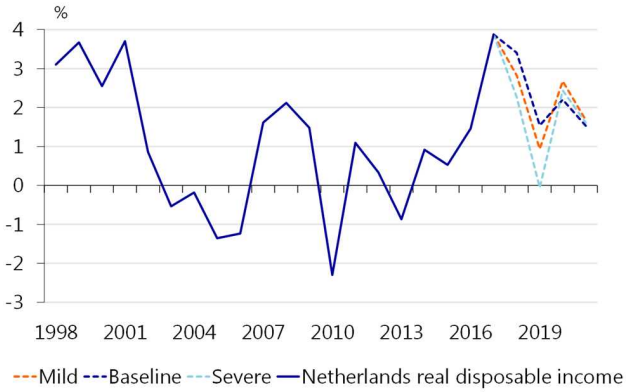
Figure 12: US stakes are high



Source: Macrobond, BEA, NiGEM, Rabobank

For the Netherlands, the effects on consumption and net export are comparable to the US, but the magnitude is smaller. In our mild scenario, only 0.5ppts of growth is shaved off over five years' time, which is hardly worth mentioning. In the severe oil scenario, the Netherlands loses 1.2ppts of GDP growth up till 2022 compared to the baseline, which is equal to 0.25ppts per year. The most notable economic impact in the Netherland is caused by rising inflation, which peaks at 3.3% in 2019, and eats into growth of real disposable income of household (which drops to 0% in 2019). Coincidentally, the inflation peak is exacerbated because of a rise in value added taxes in that same year. Lower real disposable income (figure 13) hurts private consumption in particular, which loses 2.5ppts of growth up till 2022. The improvement of net export due to a weaker Euro compared to the baseline mitigates the economic damage caused by lower private consumption. In absolute terms, the Netherlands would lose out on EUR 3.5bn on economic growth up to 2022 in a mild scenario and somewhat more than EUR 9bn in our severe oil scenario.

Figure 13: Growth of real disposable income goes to nil



Source: Macrobond, BEA, NiGEM, Rabobank

Conclusions

Due to different supply-side bottlenecks oil prices have shown a sharp increase since mid-2017, pushing Brent toward almost USD 80 per barrel in May 2018. Although Saudi Arabia and Russia recently signaled that they are willing to gradually increase the oil production in the second half of 2018, geopolitical developments such as the Iran deal and the re-election of Venezuelan President Maduro may raise political tensions with a number of important global oil suppliers in the near future. These tensions will possibly result in a disruption of the oil market and renewed oil price volatility. Therefore, we examine the macroeconomic effects of two oil price scenarios in this Special: a *mild* scenario in which we assume that the oil price will continue to climb to USD 90 per barrel and gradually comes down and a *severe* scenario in which prices are being pushed up to USD 115 per barrel and stay elevated over a long period of time.

Our results show that a surge in oil prices particularly results in a global economic loss. More specific, the world loses out on 0.4ppts of economic growth between 2018 and 2022 in our mild scenario and 0.9ppts in our severe scenario. The economic impact, however, is very unevenly distributed among countries. The economic effects can be distinguished between three different groups of countries: the vulnerable ones, the lucky ones, and the uncomfortable ones.

The vulnerable ones are net oil importing emerging markets like India and Turkey that experience severe damage in the upcoming two years due to a swift surge in oil prices, but recover somewhat from initial blows after 2020. Turkey is the only country that will end up in a brief recession in our severe scenario, with expected GDP growth of -0.5% in 2019. The lucky ones are oil exporting countries that benefit from a rise in oil prices, e.g. Middle East and Russia. Although net exports contribute negatively to GDP growth in these countries, especially in Russia domestic demand would richly flourish due to relatively low inflation (below 5%) and high earnings from oil export (GDP growth of 6.8% in 2019). The uncomfortable ones are net oil importing countries facing moderate losses, for example the US and Eurozone. The US, the world's largest oil importer after China, loses 1.9ppts of GDP growth up till 2022 in our severe scenario, which equals almost USD 500bn.

Annex I: scenario assumptions

Oil price

In our baseline for the oil price, the slightly softer numbers in the upcoming quarters reflect a rise in US production offsetting the decline caused by Venezuela. Geopolitical tensions with Iran decline and we see a modest pick-up in Libyan production. Moreover, Saudi Arabia and Russia have recently signaled to gradually ease supply restrictions in the second half of 2018. Although some of the recent boosts have been more speculative in nature, the steepening of the term structure does imply more support further out.

The *mild* oil price scenario reflects continued geopolitical stress, in particular, in Iran. It also reflects a lack of pick up in Venezuela, Libya and Nigeria. US production rises, but not enough to offset these developments and oil prices would rise to between 85 and 90 USD. In order to assess the counterbalancing impact of additional shale production, we build on the research by Middeldorp, Groenewegen and De Vreede (2018), who have developed a VAR model to estimate the production response in case of an oil price shock. Based on their insights, roughly 50% of the initial price shock has been reversed after two years.

In our *severe* oil price scenario, we assume that stability in the Middle East is undermined by a complete breakdown of the Iran Nuclear deal. As a consequence, the current proxy conflict between Iran, Saudi Arabia and Israel will escalate into armed conflict, which would have serious negative implications for global oil supply and will result in a price surge up to USD 115 per barrel. Moreover, the oil price remains elevated over a long period of time due to these severe supply constraints. Ultimately, however, the high oil price will attract substantial capex spending investment, which will result in enhanced capacity, albeit with a substantial time lag. In this scenario, therefore, we see a sharp pullback of oil prices after 2022.

Exchange rates

In our scenarios, we assume that exchange rates of *net oil exporters*, such as Mexico, the Middle East, Canada and Norway will remain stable. Currencies that we expect to appreciate are safe haven currencies, such as the Swiss franc (CHF) and currencies that show a clear positive (i.e. appreciating) correlation with oil prices rises in the past, such as the Australian dollar (AUD), New Zealand dollar (NZD), Swedish Krona (SEK) and Singapore dollar (SGD). We also expect a small appreciation of the Ruble (RUB), given the importance of the Russian Federation in the supply of oil. However, we have only penciled in a small appreciation, as the correlation between oil prices and the RUB weakened after the US imposed sanctions on Russia.

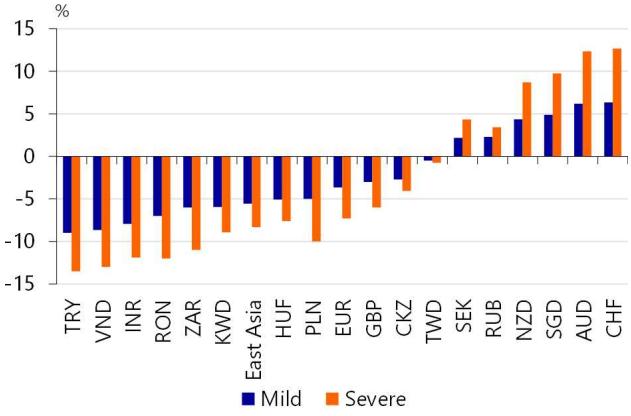
To analyse the impact of high oil prices on the exchange rate of net oil importers, we estimate the following model for all net oil importing countries:

$$\log(E_{i,t}) = c + \alpha \cdot \log(O_t) + \delta_t + \varepsilon_i \qquad (1)$$

where *E* is the exchange rate of country *i* against the US dollar on day *t*, *O* is the Brent spot price, *d* is a time trend and *e* is an idiosyncratic error term. We use daily data from January 2005 until May 2018. The model outcomes are used in our *mild* scenario to make a simple projection for different currencies. For our severe scenario we multiply the calculated effect by a scaling factor of 1.5. Besides the model outcomes, we use expert opinion of our RaboResearch FX strategists to adjust the model outcomes.

Figure A.1 shows our total expected impact on currencies against the USD from 2018Q2 until 2019Q4. Our calculations show that the Turkish lira (TRY), Vietnamese dong (the VND is pegged and foreign currency reserves are low) and Indian rupee (INR) will face the largest downward pressure in case of a further pickup in oil prices. In our mild scenarios, these currencies are expected to depreciate by respectively -9.0%, -8.3% and -7.9%. In our severe scenario, downward pressure is the largest on five currencies: TRY (-13.5%), VND (-12.5%), RON (-12.0%), INR (-11.9%) and ZAR (-11.0%).

Figure A.1: Turkish lira, Vietnamese dong and Indian rupee will face most downward pressure



Source: Macrobond, Rabobank

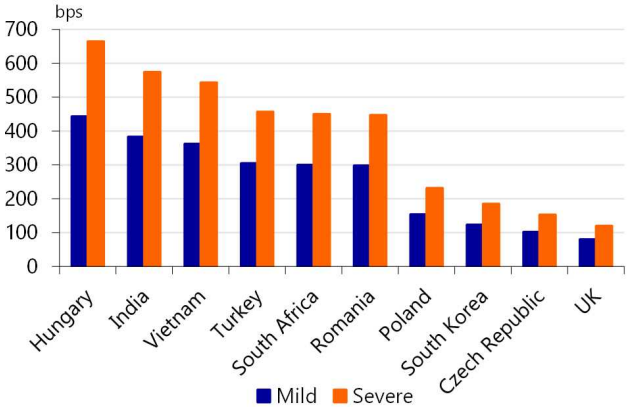
Monetary policy

Rising oil prices do not bode well for inflation, especially when oil constitutes a significant share of the total import basket. However, we do not expect an immediate response of central banks to change their monetary policies to counteract rising inflation on the back of higher crude prices. Central banks are well aware that higher oil prices result in a one-off in terms of cost-push inflation, which should make them wary to change policy rates. However, large net oil importers with vulnerable external finance positions run the risk that the pick-up in inflation will be anchored in structurally higher *inflation expectations*, which could induce e.g. labour unions to choose higher wage settings. To prevent this from happening, central banks from these specific countries could opt for a precautionary hike of policy rates in order to prevent such a scenario from unfolding. With the default options for monetary policy in NiGEM, central banks respond according to our assumptions. For the European Central Bank we choose to exogenise the policy rate until late 2020, in order to prevent a policy response to rising cost-push inflation. In case of the Reserve Bank of India (RBI), we change the monetary policy to price targeting.

Investment premium

Countries that face a heavy depreciation of their currencies will most likely also be confronted with higher investment premiums, which will raise the user costs of capital, capital-labour substitution and will weigh on private investment or domestic demand in general. In NiGEM the data for the investment premium is defined as the spread between government and corporate AAA long rates. Investment premiums can go up in case of a liquidity squeeze, a higher markup that banks charge firms or credit rationing which raises the shadow price of borrowing. During taper tantrum in 2013, we saw that many emerging markets were confronted with deteriorating metrics and saw a spike in the investment premium. To model the rise in the investment premium in our two scenarios, we use the rise in 10 years credit default swaps (CDS) spreads during taper tantrum in 2013 as a proxy for our investment premium in the mild scenario (figure A.2). In the severe scenario, we again use a scaling factor of 1.5.

Figure A.2: Investment premiums based on CDS spreads



Source: Macrobond, Rabobank

Annex II: using NiGEM for oil price shocks

Using NiGEM for scenario analyses has three main benefits. First, the model allows us to assess the impact of several key variables in the short to medium term, such as trade flows, foreign direct investment and the labour market. Second, NiGEM ensures that the global trade flows are viewed within a closed accounting setting. Thus, trade flows between countries add up to global trade and possible trade or economic shocks are accounted for via the global world trade matrix. Third, NiGEM is an error correction model (ECM), which ensures that short-term deviations of GDP from a country's growth potential are made up eventually.

An oil price shock affects the baseline in NiGEM via three different channels.

1) Import and export prices

A rise in the oil price will reduce trade between countries due to an increase of export and import prices. NiGEM treats export and import prices as a weighted average of commodity and non-commodity prices. Commodity import and export prices are a weighted average of five commodities: global oil prices, global food prices, global beverage prices, agricultural raw materials and global metals prices.

2) Oil as input

Secondly, a rise in the oil price will result in less usage of oil and consequently a decline in potential output of a country. In NiGEM the demand for energy corrects gradually on real oil price, with unit elasticity in the long run. A rise in the oil price will reduce oil usage:

$$\Delta \ln (OI)_t = \varepsilon - 0.25 * [\ln(OI)_{t-1} + 0.0025 + \ln\left(\frac{WDPO_{t-1} * RX_{t-1}}{CED_{t-1}}\right)] \quad (2)$$

where *OI* is oil usage, *RX* is the nominal exchange rate, *CED* is the consumer expenditure deflator and *WDPO* the world oil price. Oil usage directly affects oil input, which is one of the supply factors to determine potential output:

$$YCAP = \gamma[\delta \cdot K^{-\rho} + (1-\delta)\left(L_e^{\lambda \cdot TECHL}\right)^{-\rho}]^{\frac{-(1-\alpha)}{M^{\rho\alpha}}} \quad (3)$$

where *YCAP* is potential output, *K* is total capital stock, *L* total hours worked, *M* represents oil input, and *TECHL* labour-augmented technological change. The parameters are either production function parameters or scale parameters. Equation (2) is based on a CES relationship between capital and labour, embedded in a Cobb-Douglas framework. Less oil input (*M*) leads to a decline in potential output. Any deviations of *GDP* from *YCAP* feeds into the price system, which brings demand in line with supply.

3) Inflation and domestic consumption

A higher oil price affects inflation via the channels mentioned before (via higher import prices and indirectly via lower potential output), as well as an increases of producer prices. Higher inflation leads to lower disposable income, purchasing power and, consequently, lowers private consumption of households. This negatively affects GDP growth.

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