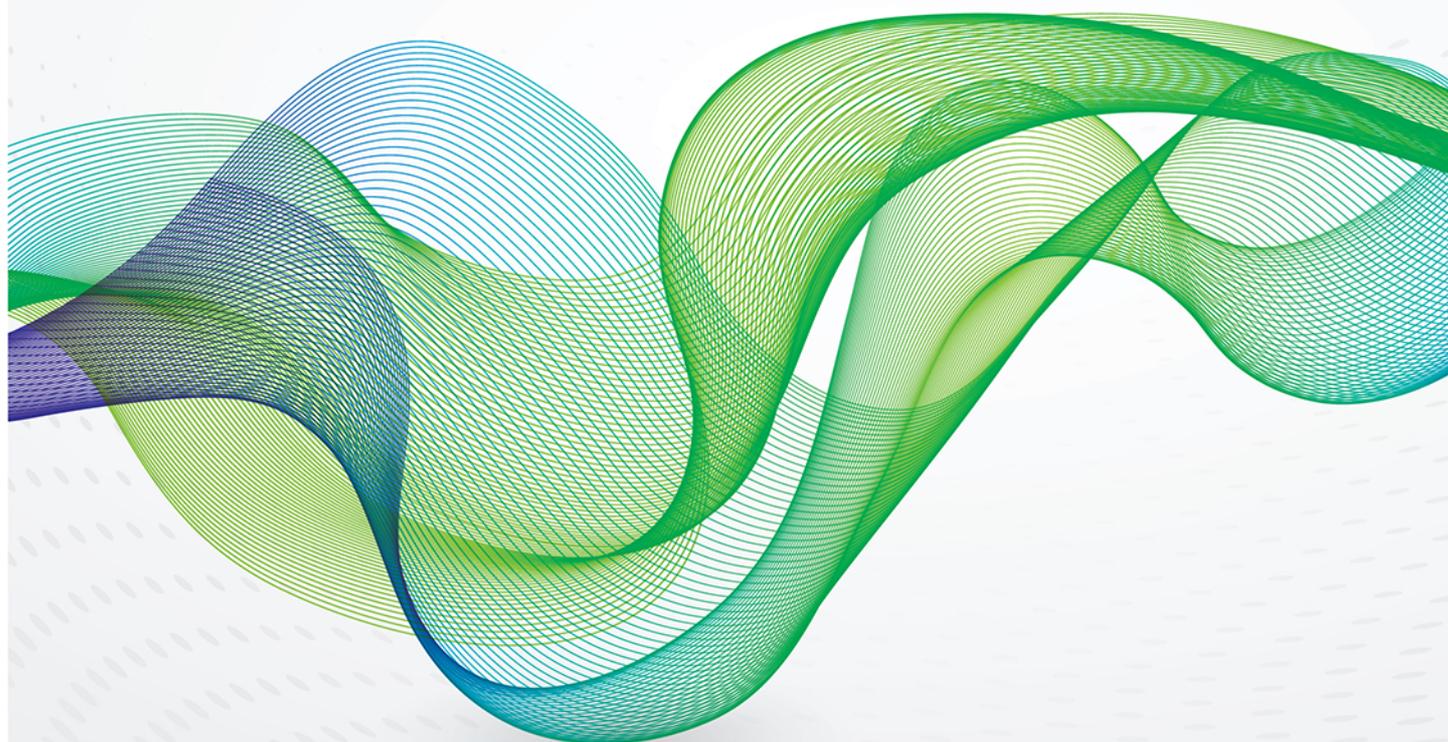




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Can Russia and OPEC draw any lessons from Mexico's oil hedge?



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Introduction

Russia's renewed interest in hedging its oil export revenues¹ has sparked an old debate on whether macroeconomic policies to mitigate the consequences of commodity price volatility, such as establishing revenue stabilization funds to smooth government expenditure over time,² should be augmented (or even substituted) by the use of financial instruments such as futures and options. Given their high reliance on oil export revenues and the negative impact sharp price falls and volatility have on their economies, it is argued that oil producers, including some of the largest ones, should develop their hedging capabilities as part of an overall strategy aimed at protecting their economies from sharp oil price movements.³ Mexico's experience in hedging its oil exports is often used as an example of a successful case that other producers could follow.

This is not only related to the issue of macroeconomic stabilization, but also as to whether the use of such financial instruments can enhance producers' competitive advantage in oil markets and provide them with added flexibility and additional tools to manage the market. For instance, many have argued that Mexico's hard stance during the OPEC+ talks in April is directly related to the fact that it had a hedging programme in place.⁴ Also, while the world's biggest producers such as Saudi Arabia, Russia and other OPEC producers possess a comparative advantage in terms of their lower cost of production and hence ability to compete in a low price environment, North American producers have a different kind of advantage in their ability to hedge production forward and potentially lock in higher prices than OPEC+ members could get for spot barrels when the market is in contango. Thus, there have been some suggestions that OPEC+ should consider new tools to influence the shape of the curve,⁵ including selling oil forward to push prices downward along the futures curve⁶ and discourage small US shale producers from hedging.

In this short Comment, we review the results of the main case study in this area, the large-scale put option buying programme administered by the Government of Mexico and assess whether such a programme can be replicated in Russia. We also discuss whether other low-cost producers could potentially also consider participating in the growing market for oil derivatives and in what ways. We argue that Mexico's experience is unique in many respects and that Russia and other oil producers with large volumes of production and pricing power face serious limitations in replicating Mexico's experience. We also find that any direct replication of the Mexican hedging programme at today's market prices does not make much economic sense for Russia. Buying the hurricane insurance the day after the hurricane is unlikely to be good idea. This does not imply though that Russia and other oil producers should not develop their capabilities and participate more actively in derivatives markets. However, this takes time and requires building institutional, legal, financial, and trading capabilities and developing unique strategies that complement (and do not disrupt) their existing policies and are reflective of their size and influence in the oil market.

Mexico's Oil Hedge: past and present

The first foray by the Government of Mexico into oil hedging goes back to 1990 when the country was able to successfully capture the initial spike in oil prices caused by the start of the Gulf War.⁷ However, it was only ten years later when the proper programme had been put in place with the creation of the

¹ N. Doff, J. Blas and O. Tanas (2020), 'Putin Considers Mexico-Style Oil Hedge as Insurance Against Slumps' Bloomberg, 22 July, <https://www.bnnbloomberg.ca/putin-considers-mexico-style-oil-hedge-as-insurance-against-slumps-1.1469099>

² See for instance, N. Sugawara (2014) 'From volatility to stability in expenditure: Stabilization funds in resource-rich countries (IMF Working Paper WP/14/43). Washington, DC: International Monetary Fund. <https://www.imf.org/external/pubs/ft/wp/2014/wp1443.pdf>

³ See for instance, J.A. Daniel (2002), 'Hedging Government Oil Price Risk', *The Journal of Energy and Development*, vol. 27, no. 2, pp. 167–178.

⁴ See J. Blas and A. Stillman (2020), 'The Secret Weapon Giving Mexico Power in the Oil-Price War', Bloomberg, 11 April 2020. <https://www.bloomberg.com/news/articles/2020-04-11/the-secret-weapon-that-gives-mexico-power-in-the-oil-price-war>

⁵ J. Blas (2020), 'OPEC+ Tries Novel Strategy to Turn Oil Price Curve Upside Down', Bloomberg, Jun 6, 2020

⁶ See P. Verleger (2020), 'Operating a Central Bank for Oil', World Energy Opinion, Energy Intelligence, June 2020. However, as the author recognises, there are risks in implementing such strategy as it might encourage speculators to buy long-dated futures hoping that they can 'ride the curve upward for profit' which in turn may push producers to sell more oil forward. There is also the danger that this may cause the entire curve to shift downwards in parallel fashion.

⁷ Mexico had an ever earlier experiment with the issuance of the so-called 'Petrobonos' in 1977. The yield of the petrobonos was adjusted by the oil price and allowed the Mexican government to issue public debt at a lower cost. While it's not a hedging system per se, it was the first use in Mexico of oil-linked financial instruments.

special budget allocation for the Oil Revenue Stabilization Fund, which was subsequently renamed the Budgetary Income Stabilization Fund (FEIP) with its scope expanded.⁸ The colorful history of the hedging programme and its significance to oil markets has been well documented by Blas.⁹ Fortunes have been made and lost by market-makers¹⁰ trying to capture a slice of the largest annual derivative deal and sometimes failing to manage the enormous risks that the deal entails.

The idea behind the programme's creators was to look at hedging as an insurance policy against a drop in oil prices. Buying put options is akin to an insurance where the premium is paid upfront with the holder potentially receiving compensation for the amount by which the oil price falls below a predefined level, known as the strike price. The higher the strike price, the higher the potential compensation will be, but at the expense of a larger initial premium. The trade-off between how much to pay versus the optimal level of protection is a tricky exercise. The answer changes every year depending not only on prevalent market conditions and prices, but also on many other factors, including the country's budget, borrowing costs, and the exchange rate.

The strike price is typically set slightly below the average forward prices for the following year at the time of the hedge, and it is ultimately linked to the oil price used for the country's annual budget.¹¹ Specifically, the treasury selects the strike price equal or close to the oil price assumed in the budget, which in turn depends on certain assumptions around the export prices of its oil for the subsequent fiscal year computed as a weighted average of 10 years of historical prices and up to 5 years of future prices.¹²

The primary determinant of the cost of the option, at which dealers are willing to underwrite such insurance, is the anticipated market volatility, known by option traders as implied volatility. To bring the costs down, Mexico opted for a non-standard annually settled average price put option which has a significantly lower volatility than commonly traded strips of options with monthly settlements. It is easy to see why. The latter can still pay off in some months when oil dips below the strike price, but if the price subsequently bounces, then it could pull the entire annual average up above the strike price. Such a smoothing effect over time makes the deal less risky for option dealers and thus reduces the size of the premium. If the country's primary objective is to protect the annual average price, then saving some money on buying a cheaper option with a single annual settlement makes good economic sense. Also, initially Mexico hedged against WTI crude, later moving to hedge predominantly against Maya. Therefore, early on, Mexico carried the basis risk between WTI and its own crude, when it later moved into Maya the basis risk was reduced.

However, even after the discount from such volatility reduction, put options are still rather expensive and carry a risk premium to incentivize dealers to offer the product, much like any other insurance policy does. Figure 1 approximates this risk premium by accumulating both costs and payouts since the programme's formal induction in 2002.

The options paid off only three times after oil prices fell in 2009, 2015, and 2016 with the fourth payoff expected to be collected this year. Obviously, the premium has been paid every year, except for 2003–2004 when the government decided not to run the hedging programme. As can be seen from Figure 1, the cumulative profit and loss from the entire programme for the Mexican government, until this year, was around zero. In addition, the hedge has accomplished what it was designed to do. It was effective in stabilizing export revenues by transferring funds from times of 'excess' revenues to times of low oil prices when additional funds are badly needed. The insurance has also reduced the cost of Mexico's sovereign debt. A recent study finds that by using put options, Mexico generated welfare gains

⁸ See J. Duclaud and G. Garcia (2012), 'Mexico's Oil Price Hedging Program', in R. Arezki, C. Pattillo, M. Quintyn, and M. Zhu, eds., *Commodity Price Volatility and Inclusive Growth in Low-Income Countries*, (Washington D.C.: International Monetary Fund).

⁹ See J. Blas, (2017), *Uncovering the Secret History of Wall's Street Largest Oil Trade*, *Bloomberg*, April 4, 2017.

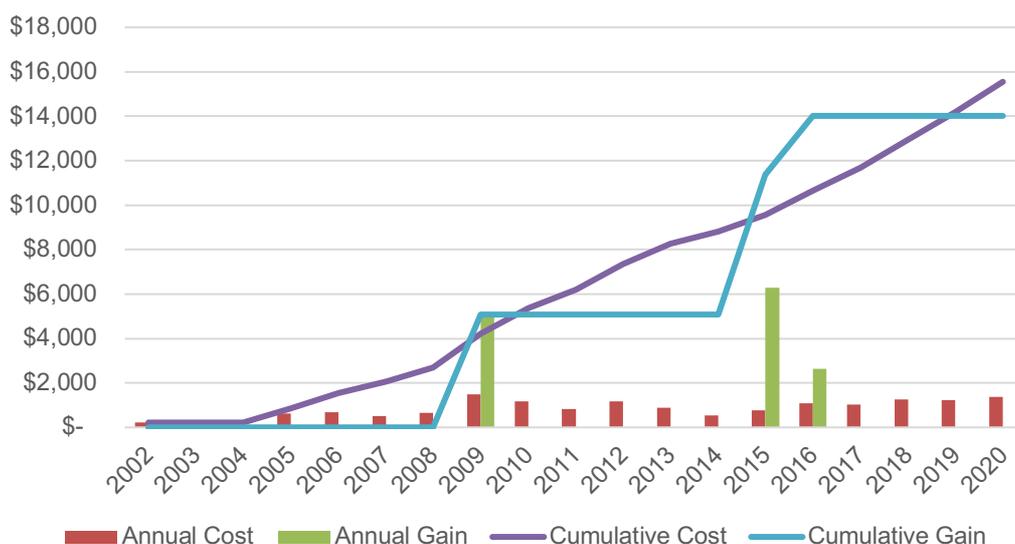
¹⁰ See for instance, B. Henderson (2015), 'What I Learned from Losing \$200 Million', <http://nautil.us/issue/31/stress/what-i-learned-from-losing-200-million>

¹¹ In some years, the budget price exceeded the strike price with the gap covered via transfers from a special sub-account.

¹² M. Chang M & F. Valencia (2018), 'Welfare Gains from Market Insurance: The Case of Mexican Oil Price Risk', *IMF Working Papers* 2018/035, International Monetary Fund.

equivalent to a permanent increase in consumption of 0.44 per cent with about 90 per cent of the welfare gains due to the reduction in borrowing costs.¹³ Specifically, the study finds that risk spreads on debt were 19 basis points lower in the hedging economy than the unhedged economy. It is also likely that the well-timed execution of the programme is what has allowed Mexico to receive enough benefits relative to the cost without incurring any large risk premium which should be embedded in any insurance product. Development of a framework to optimize the execution of the hedging strategies and reduce its overall cost has been key to the success of Mexico's hedging programme. This involved choosing to trade during times of good liquidity conditions and avoid periods of high implied volatility and low liquidity.¹⁴

Figure 1: Cumulative results of Mexican sovereign hedging programme since inception (US dollars, millions)



Source: Auditoría Superior de la Federación, Secretaría de Hacienda y Crédito Público.

We should also note that the option premium was typically paid 15–18 months before the final settlement which occurs in early December of the following year, so the time-value of money is not included here. If one adjusts the premium paid by the time value of money calculated at Mexico's borrowing rate, then the programme would have resulted in a small loss due to the opportunity cost of deploying these funds elsewhere. On the other hand, one can also include the impact of foreign exchange here. With the steady depreciation of the Mexican peso over these years, buying put options in dollars paid in advance and converting large three payoffs back into pesos at a more favorable exchange rate a year later would have increased the cumulative gain from the programme if measured in pesos. In aggregate, these two effects largely offset each other, and we chose to present the summary in US dollars to match how the deals were settled with international counterparties without any adjustments for the time value of money or the exchange rate.

Does this mean that the banks did not make any money on these deals? The answer is no. There are essentially two alternative valuations for options. One is simple, often called the actuarial valuation which comes from the insurance industry and compares historical costs to average historical payoffs. This is exactly what is done in Figure 1. The alternative way is related to how dealers value options based on the total costs of their dynamic replication with futures. By selling options and delta-hedging

¹³ M. Chang and F. Valencia (2018), 'Welfare Gains from Market Insurance: The Case of Mexican Oil Price Risk', *IMF Working Papers* 2018/035, International Monetary Fund.

¹⁴ See J. Duclaud and G. Garcia (2012), 'Mexico's Oil Price Hedging Program', in R. Arezki, C. Pattillo, M. Quintyn, and M. Zhu, eds., *Commodity Price Volatility and Inclusive Growth in Low-Income Countries*, (Washington D.C.: International Monetary Fund).



those options,¹⁵ banks also take on volatility risks. But they are deemed to be experts in volatile markets as a large portion of corporate hedging is also executed via options. For volatility market-makers, the value of additional information from the largest options trade of the year is highly significant, and banks are usually able to capitalize on this information by properly prepositioning themselves for the deal and accumulating similar options purchased from their counterparties.

Anecdotally, the value-added of the programme to the banks was steadily decreasing over time as the Mexican government learned from their early experiences and developed their own trading desk with the mandate to execute the programme more efficiently and minimize the leakage of valuable information to the market. It reduced the size for individual transactions, spread them out in time to make the impact on market prices less visible, and diversify the set of counterparties by bringing oil companies, such as Shell and BP, to compete along with the banks. In short, Mexico learned how to shop around.¹⁶ It even got to the point when some of the major banks opted not to participate in the programme at all. If the value to dealers comes mostly from the information flow, and when such information becomes less exclusive and harder to leverage, then dealers' motivation to participate is reduced.

Moreover, US regulations, including Dodd-Frank, designed to improve transparency did not help the banks either, as certain information was disseminated to a broader market. If the deals were executed with US persons which includes all US branches of Western banks, then transactions had to be reported on Swap Deposit Repository (SDR). This means that every oil trader and broker could see all transactional details, except for the counterparty names, on their Bloomberg terminals. Since the programme had such a high profile, even anonymous deals were immediately recognized by the entire trading community who rushed to bid up the value for put options in anticipation of more deals. Mexico went as far as lobbying the US Federal Reserve and the US Treasury on the Dodd-Frank regulation in 2012, arguing that 'the Volcker Proposal would significantly increase the costs of end users' activities in the commodities markets, including those with the sole purpose of hedging commercial activities. A commodity hedge programme of the size and with the characteristics of Mexico's oil price hedging programme requires swap dealers to take significant commodity risks for extended periods of time in order to provide liquidity to markets'.¹⁷ While most banks were able to move the execution to their European desks bypassing Dodd-Frank requirements, some slipped up and had to report the transactions, which apparently greatly displeased the Mexican government.

Finally, last year Mexico announced their most recent defense mechanism to further protect the secrecy of their programme by announcing that even transaction volumes, and the size of the overall programme, will now be deemed a state secret and no longer disclosed to the public until five years after its completion.

One open question that is on every oil trader's mind today is whether Mexico will continue to hedge this year or not. Again, it would be useful to look at history to compare today's economics to the years when the put options paid out. Figure 2 shows the strike prices which were locked in from 2008–2020.

At the time of writing, the forward price for Mexican Maya grade for the next year has fluctuated at around \$40 per barrel. Despite lower oil prices, the option premiums have not decreased given how volatile oil prices were earlier this year. By hedging today at low strikes and paying high premiums, Mexico will be locking in the effective budget price near all-time lows. At the same time, history clearly indicates that positive payoffs happened when hedging was executed at higher strike prices. It is obvious that the chances of getting paid from the insurance with a strike price of \$80 (for instance in

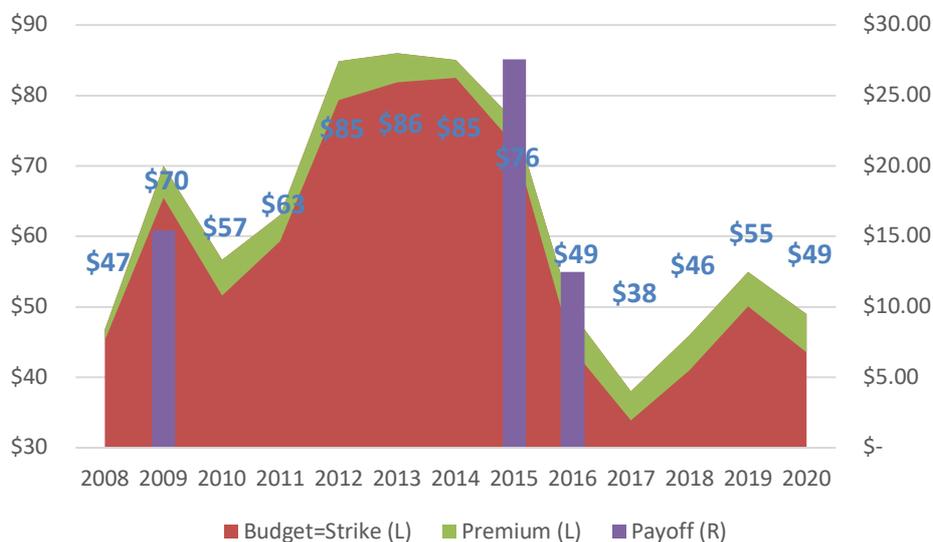
¹⁵ Delta-hedging means dynamically offsetting the option's sensitivity to price with futures which makes dealers instantaneously neutral with respect to the price direction, but exposed to the volatility of prices which can only be hedged with other options.

¹⁶ The early days of the hedge was dominated by Goldman Sachs (1990s and since the inception of the systematic hedge in 2000) and Morgan Stanley (from 2000). Later other banks arrived, notably Barclays Capital, Deutsche Bank and JPMorgan. Much later, from 2008 onward, Mexico brought a much wider number of banks, including the likes of BNP Paribas, Citigroup and others. The hedge, which started with one or two banks, widened to include up to 8 banks, plus two oil companies. As a result, margins collapsed and some banks such as Morgan Stanley decided against participating on the hedge several times.

¹⁷ See: Meeting between Federal Reserve Board and Other Agency Staff and Representatives of the Mexican Government October 26, 2012, https://www.federalreserve.gov/newsevents/rr-commpublic/mexican_government_meeting_20121026.pdf

2014) are much higher than when the strike price is only \$40, and one still needs to dole out another \$4 of the option premium.

Figure 2: Put option strikes and positive payoffs



Source: Auditoría Superior de la Federación, Secretaría de Hacienda y Crédito Público.

Mexico has a tough choice to make this year and may soon run out of time as the programme must be completed during the next three months before the beginning of the hedging term which runs from December 2020 until November of the following year. Our understanding is that the reason for this unusual term is simply the preference to receive the final payment in early December in order to have enough time to convert the proceeds into pesos and include the final payout in year-end accounting reports. With such low strike prices, elevated volatility leading to high options premia today and additional pressure from simply running out of time, it will not be surprising if Mexico decides to take the first break from hedging in over fifteen years. In the meantime, the market is anxiously waiting, as whether Mexico hedges or not, can easily impact the price by up to \$5 per barrel or even more if the programme’s execution must be completed at a rapid-fire pace as the market may not be able to absorb large amounts of selling over a very short period of time.

Russia versus Mexico: more differences than similarities

Last month, President Putin ordered his government to consider hedging Russia’s massive oil and gas export revenues to protect the country from price falls¹⁸. Russia’s recent interest in hedging should not come as a complete surprise. Since 2002 Russia has, on a number of occasions, considered hedging its production. In 2008 Russia was very close to reaching a deal with some US banks, but the attempt failed for multiple reasons and by the time Russia was willing to go ahead, oil prices were already in free fall. From the Russian perspective, there was reluctance to take any large bilateral counterparty exposure and/or to pay an option premium or post margins on foreign exchanges. Multiple banks tried to address these concerns by proposing alternative products such as an embedded hedge in sovereign debt. The idea was to issue a sovereign bond, but instead of the yield being adjusted by the rate of inflation, it would be adjusted by oil price movements (i.e. the yield rises when oil prices rise and falls when oil prices drop).

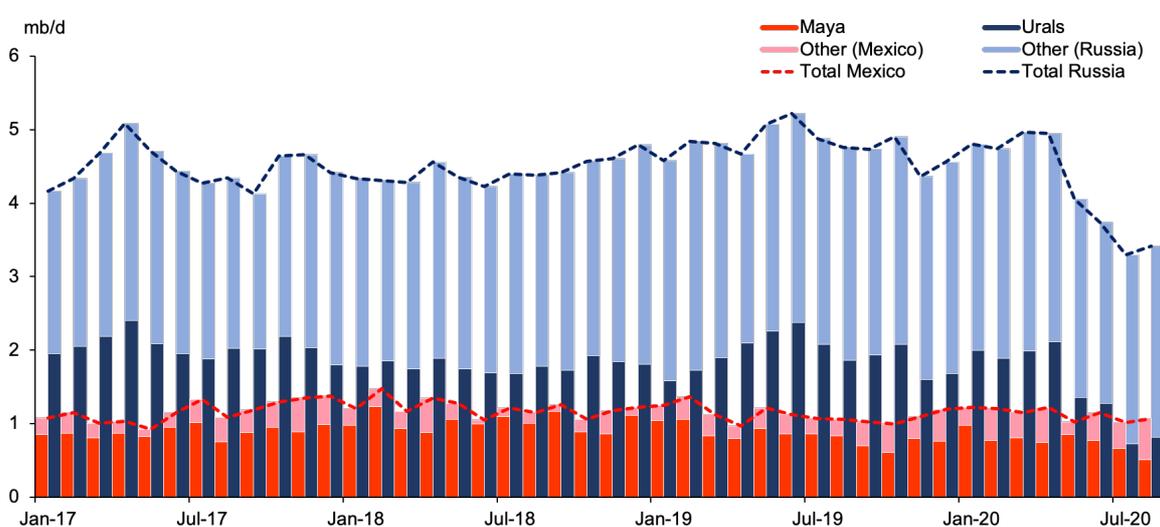
The question of whether Russia should follow the example of Mexico is far from straightforward. Having such capability in place would provide the country with more optionality to manage price risks in the

¹⁸ N. Doff, J. Blas and O. Tanas (2020), ‘Putin Considers Mexico-Style Oil Hedge as Insurance Against Slumps’ Bloomberg, 22 July, <https://www.bnnbloomberg.ca/putin-considers-mexico-style-oil-hedge-as-insurance-against-slumps-1.1469099>

future. The capability could even be considered of strategic importance. Having said that, there are a number of challenges that the Russian government needs to consider.

First, its oil exports are much larger than Mexico's (see Figure 3). If Russia is only interested in hedging its entire export volumes, then the liquidity must be considered more carefully as in its full size, the hedge will be at least three times as large as the largest oil derivatives deal in the market today. This type of deal will be impossible to keep secret as the market by now has learnt how to uncover traces of large hedging deals without any direct involvement. Even today many oil traders are tracing Mexico's hedging programme by deducing possible flows from the movements of Maya price differentials, from the shape of volatility curves and skews, from related transactions on SDR which banks use to hedge their own risks, and from changes in aggregate positioning by dealers.

Figure 3: Mexico and Russia crude exports by grade



Source: Kpler, OIES.

Second, there is a difference in borrowing costs between Mexico and Russia. In general, Mexico has always carried higher levels of debt so having an oil hedge in place brings additional value to Mexico as it arguably decreases the country's default risk and, therefore, the interest rate paid to bondholders. For Russia, servicing debt has not been a major challenge, and having the hedging programme in place is unlikely to bring down borrowing costs especially in today's low interest rate environment.

Third, Russia could have some political reservations about the hedge dependency on Western banks as counterparties. Since the standard put option requires the premium to be paid upfront, Russia will face serious risks if banks are unable to meet their obligations when put option expire in-the-money. In other words, once the upfront premium is paid, all the risk of non-performance in payments due to regulatory/sanctions risk is borne by the sovereign. One possibility to reduce this risk would be to request a so-called deferred premium option where no cash is exchanged on the day of the transaction, and instead the premium is paid at settlement and netted against any potential payoff. Such deferred premium options are not uncommon and used by shale producers who are often short on cash to pay it in advance. An alternative would be to use a swap or collar structure which involves financial flows in both directions over an extended period (see below for more discussion).

Fourth, another potential challenge is banks' own aversion to any risks related to possible sanctions. For US and European banks with an already significant Russian presence, compliance department concerns are likely to prove a major obstacle even if the hedge is designed in such a way that the financial impact of such risks is reduced by payment deferral and no cash is exchanged until settlement. The lead for the hedge could be taken by Russian banks or non-US/non-Europe banks less concerned by US sanctions. However, it would be difficult to get sufficient risk-bearing capacity from

these sources for any significant hedge. Those banks would ultimately need to pass volumes to the larger banks, and compliance departments come to the fore again, and they might note the addition of significant minor-bank risk on top of the sanctions and sovereign risk. Another angle, in case local banks and other banks couldn't do the required volumes, would be to try to cut out Western banks completely by using traders as liquidity instead. That comes at a price (the implicit cost of capital used by trading companies is higher than a bank, indeed the trading companies often rely on banks for lines of credit), and trading companies also have compliance departments, albeit possibly less risk-averse ones than banks.

But Russia has one advantage over Mexico. Hedging Mexican Maya is much more difficult than hedging Russian Urals. The Wall Street banks which sold put options to Mexico always struggled to reinsure themselves in the market and have been forced to implement 'imperfect' hedges with a cocktail of Brent, WTI, multiple grade differentials, European and Gulf of Mexico fuel swaps to lay off their own risk. Even though the Maya formula was simplified last year to include only Gulf Coast WTI and Brent, it still embeds so-called K-factor adjustment determined by Mexico itself which makes Maya swaps difficult to hedge. In contrast, there is already a paper swap market for Urals (though thin), and there's appetite for Urals and, notwithstanding recent movements, it is correlated to Dated Brent/ICE Brent.

Russia also has an existing and fairly successful budget buffering mechanism which relies on the so-called oil cut-off price. This price was set at \$40 for Urals in 2017 with subsequent annual 2 per cent adjustments which brings it to \$42.40 for 2020. Any oil revenues above the cut-off price are being diverted to the National Wealth Fund (NWF). July was the first month since February when Urals monthly average exceeded this threshold with year-to-date average so far slightly above \$40. This, however, has not led to new contributions to the NWF, at least so far, owing to lower than expected volumes of oil and gas exports this year. While Russia may not be able to contribute to NWF until both oil price and export volumes recover to the pre-crisis projections, which is unlikely this year, it may not need to fund the deficit by much if the annual average price ends up being close to \$42.40.

This system has been an overall success in terms of managing rouble exchange rate volatility and saving money for a rainy day. It is based on a relatively low threshold and institutionalises the fact that the state budget should not depend on a higher oil price than that already set. In this respect, the hedging proposal through the use of financial instruments is not 'an alternative' to diverting the oil windfall into the NWF. The funds accumulated in the NWF, according to the existing rules, should be invested either in a portfolio of foreign currencies or in 'safe' debt securities. The proposal is whether to complement the existing instruments for investing NWF's funds with new ones. The key question is whether there is a case to invest the funds in options to ensure against oil price volatility.

There has been strong opposition within Russia to a hedging programme similar to the Mexican one. The Ministry of Finance believes that the current system of the budget rule is a sufficient hedge. The Russian Central Bank also opposes it on the basis of feasibility and cost. Particularly, it is skeptical as to whether derivatives markets would allow a big hedging operation to be carried out and is concerned about the cost of a hedging programme, which could prove to be very expensive and therefore not the best way to spend NWF's money. Like the Ministry of Finance, the Central Bank 'is completely unconvinced' that a mechanism other than the budget rule could perform better.

The economics of Russia's cut-off price conceptually play a similar role as the strike price of the put option. One can again apply the difference between the actuarial valuation of the insurance versus the volatility-based approach in the derivatives market. By saving 'excess' funds in the NWF during good times and spending them during bad times, Russia is effectively practicing the actuarial risk management approach. Mexico, on the other hand, opted for volatility-based risk management which embeds paying an additional risk premium to the banks. However, by proving to be a good trader, Mexico has been able to offset this risk premium by being generally correct on timing its hedge. Otherwise, buying any insurance over a long-period of time should have resulted in a loss for the buyer or a gain for the insurance providers which is necessary to keep them in the business of underwriting insurance.

But, as we learned from Mexico's experience, there will be times of higher oil prices or lower insurance premia which increase the probability of the insurance to ultimately pay out given the cyclical nature of the oil markets, and one needs to be ready for such times. The Mexican experience has shown that timing, flexibility, transparency and efficient execution are key to the success of hedging programmes, as is the institutional and governance framework.

In what follows, we check the economics of hedging if Russia indeed decided to embark on a first hedging experiment, perhaps of a small size with no material impact on the market. Table 1 below shows the current prices for Brent options for the full calendar year 2021. We consider three alternative strategies. The first one buys the strip of monthly settled put options struck at \$45 which cost \$4.90 (as of August 10, 2020). We left out the annually settled option which does not bring any material savings for 2021 hedging at current prices. Unless such option is struck further out-of-the-money, the volatility reduction no longer offsets an extra cost resulting from the longer time to maturity. This pricing challenge is also likely to be one of the primary factors that has restricted Mexico's ability to execute their programme so far this year.

Table 1: Costs and potential payoffs for various hedging strategies

Strategy	Strikes			Cost	Payoffs for Prices Range between \$30.00 and \$70.00				
	Put (Sell)	Put (Buy)	Call (Sell)		30.00	40.00	50.00	60.00	70.00
c21 Brent = \$47.80									
Put		45.00		4.90	15.00	5.00	0.00	0.00	0.00
Put Spread	35.00	45.00		3.00	10.00	5.00	0.00	0.00	0.00
Put Spread vs Call	35.00	45.00	55.00	0.00	10.00	5.00	0.00	-5.00	-15.00

Source: Pentathlon Investments, LCM Commodities. Market data as of August'10 2020.

The second strategy buys put spreads which can be viewed as an insurance policy with a cap on its maximum payout. For example, in the case of \$35–45 put spread the buyer would be partially financing the purchase of \$45 put by selling cheaper lower strike \$35 put. The payoff would be similar to a \$45 put but capped at \$10 regardless of how low the oil price goes. Put spreads are significantly cheaper than put options like any insurance with capped compensation versus insurance with unlimited payoff. In addition, the buyer would be benefiting from so-called volatility skews, defined as the premium in volatility terms for options with lower strikes. For example, for \$35–45 put spread Russia would be buying \$45 put option at 37 per cent volatility and partially financing the purchase by selling \$35 put option at higher 43 per cent volatility.

The third strategy, which is the one most popular among US independent producers, could be very suitable for Russia as well, is known as the costless three-way structure. Here, instead of paying any cash to buy the put spread, the buyer would be selling a call option struck at \$55 to finance the purchase. By doing so, Russia would be giving up an upside above \$55, but in return receive a hedge with the maximum payoff of \$10 at zero cost. Such strategy is short volatility as two cheaper options are sold while only a single, but more expensive, option is bought. The challenge obviously arises from the possibility of larger losses on the short call option if oil prices exceed \$55. It will not be possible to tie such a hedge to the budget price, but for Russia it may not be needed. The size of the NWF, which is currently at 10 per cent of GDP, should have more than enough capacity to handle the risks in transactions of this nature. Such derivatives transactions won't incur paying any systemic risk premium for the insurance as part of the risk here is taken by Russia itself. Despite some added complexity, such strategy could be more appropriate for Russia than direct replication of the straightforward insurance-like programme developed by Mexico. This strategy would allow Russia to leverage its own real optionality of being a large low-cost producer by selling some upside at the high price in return for receiving the downside protection for free instead of paying up to buy the insurance.

To conclude, any direct replication of the Mexican hedging programme at today's market prices does not make much economic sense for Russia. Buying the hurricane insurance the day after the hurricane is unlikely to be good idea. However, investing in building appropriate infrastructure and capability to be leveraged in the future does. Buying some sort of limited protection at much lower or even zero cost could be beneficial for building that capability.

Should other producers consider hedging?

Russia's plans to hedge all or part of its exports could prompt other large producers to follow suit. This in turn would amplify some of the challenges discussed above. For instance, the market may not be able to handle additional volumes from other big producers especially at times when liquidity along the curve has fallen substantially without a massive increase in cost. And even if the market does overcome the liquidity issue and find enough players to offer insurance, the ability to place it in the market opaquely is too limited. But even if these challenges are overcome, the signal that big producers are taking insurance against lower oil prices would influence market expectations and current and futures prices. It would also affect the dynamics within OPEC+ and the incentive to cooperate on production cuts. Buying a put option at a certain strike price and cutting output in an attempt to lift prices above that price are contradictory policies and for those producers that decide to hedge, they are most likely to shift to becoming fixed volume producers. This in turn would influence the market's view on the effectiveness of OPEC+ policies in balancing the market which could amplify volatility.

Another key problem for hedging is political. For a government to spend hundreds of millions of dollars, which could have been used in other parts of the economy, on an insurance that may not be used is a very risky strategy and if the option is out of the money, there may be a political backlash. A good example is Ecuador whose government was heavily criticized in 1993 and suffered political backlash after a poorly designed programme resulted in losses.¹⁹ Mexico is quite unique as the programme is institutionalized and having run for more than two decades, the politicians there feel that the opportunity cost is the other way around: if the government does not implement the programme, and later it is needed, then the government is in deep trouble. Thus, it should come as no surprise that Mexico has remained alone as a sovereign oil hedger and while countries such as Ecuador, Ghana, and Uruguay have relied on hedging instruments to guard against oil-price volatility,²⁰ these were not institutionalized.

This raises more fundamental issues related to whether a producer or a group of producers who are in a position to reduce volatility through their output policy should take insurance against volatility. It also raises the issue of whether big producers should buy or sell insurance. If the demand for insurance increases and if financial markets are not deep enough to meet this increase in demand, is there a case for a big producer or a group of producers to provide this insurance themselves?

The answer to this question is not straightforward as this depends on a number of factors. But under certain conditions, this could provide producers with a valuable opportunity. For instance, if a small producer wishes to buy a put option at a strike price of \$40, big producers or a group of them can offer to sell this option at a premium, then cut their production and increase the price above the strike price to render those options 'out of the money'. The premiums collected on the put options would partially compensate for producers lowering their output without undermining their current policy.

This example is oversimplified, and the risks associated with this strategy are very high as many factors other than producers' policies influence the oil price and as COVID-19 has shown, the market can be subject to extreme shocks. Also, a small group of producers may end up being the only balancing party, increasing their risks and reducing their pricing power. Also, the capabilities required to engage in derivatives markets to implement such schemes need to be developed.

But despite these risks, it shows, that the case for a big producer buying insurance is not straightforward; in fact, the case to sell insurance or a combination of selling and buying options through more complex strategies is also strong given their size and influence in the market. It also shows that increased volatility and greater demand for insurance may represent an opportunity, both as buyers and sellers of insurance depending on market conditions, for the big producers' trading companies. But as important, building institutional, legal, financial and trading capabilities are key to engaging effectively in derivatives markets and these take time to develop.

¹⁹ Reuters (2020), Mexico hedges oil output for 2020 as risks grow, Reuters, JANUARY 3, 2020, <https://www.reuters.com/article/us-mexico-hedge/mexico-hedges-oil-output-for-2020-as-risks-grow-idUSKBN1Z2277>

²⁰ M. Chang & F. Valencia (2018), 'Welfare Gains from Market Insurance: The Case of Mexican Oil Price Risk', IMF Working Papers 2018/035, International Monetary Fund.