Economic Issues, Vol. 26, Part 1, 2021

Does the Covid-19 Shock Matter for Monetary Policy?

Nicholas Apergis[1]

Abstract

This paper explores for the first time how the Covid-19 shock affects a monetary policy rule after it has been separated from other potential structural shocks. The novelty of this empirical analysis will illustrate explicitly why monetary authorities can respond immediately to the pandemic crisis by cutting policy rates. The findings show that central banks behave differently to different types of shock, with the long-run responses of policy rates to inflation meeting the Taylor principle for the Covid-19 shock. The results are robust to alternative modelling specifications. Monetary policy rules that explicitly consider the pandemic crisis can play a vital role in limiting the economic and financial damage caused by efforts to contain Covid-19 and, in that way, can help support the strict public-health measures that are needed to save lives and set the stage for economic recovery.

JEL Classification: E52, C33
Keywords: Covid-19, monetary policy rule, OECD countries

1. Introduction

The Covid-19 event has had a strong (negative) impact on the global macroeconomy. In a very short time, Covid-19 has moved from a potential risk to the dominant issue globally. The virus and the required containment policies have been driving almost every decision for households and businesses. Work and consumption have ceased in most sectors, which directly impacts both supply and demand across the economy. Overall, the Covid-19 pandemic crisis has heightened doubt, devastated economies and above all increased uncertainty in this already uncertain world.

The virus has spread worldwide and infected millions of people, causing over a million deaths. In this pandemic, infrastructure has been disrupted, such as health systems, transport, trade, and public services. The underestimation of the uncertainty risks is expected to give rise to strategies which will prove just as powerless to protect national economies against the dangers which threaten them, as they seek to take advantage of the opportunities and challenges possibly generated by higher levels of uncertainty.

This unpredictable situation should shake up monetary policy, which it is believed to be an essential tool in seeking systematic and valid strategic decisions in the uncertain environment of Covid-19. The evidence suggests a clear landscape in which periods of increased uncertainty are followed by persistent increases in the unemployment rate, price instability, lower confidence, a disruption in the exchange rate, and a slowdown or recession in economic activity. Therefore, the first line of defence against such an event is monetary policy that cuts interest rates. Central banks have realised the risks incurred by this pandemic event for the entire economic system and have adopted appropriate strategies and policy measures to counteract the expected downturn.

Basic monetary policy fundamentals consider that supply shocks generate a trade-off for policymakers, whereas a demand shock does not. Based on this framework, as well as on the above Covid-19 discussion, the goal of this paper is to estimate a monetary policy rule and to identify, for the first time, how central banks have possibly altered their monetary reactions in response to the Covid-19 event, once this shock is separated from other potential shocks that drive monetary policy decisions. In other words, the analysis considers Taylor rule-type interest rate prescriptions associated with unemployment gaps affected by the Covid-19 shock.

After all, the Fed's response to Covid-19 has increased the chances that its balance sheet will remain immense for a long time. Returning to 'normality' would require shrinking the balance sheet and returning to a 'corridor-type' operating system that restores the link between the balance sheet and monetary policy. The novelty of this paper is that the analysis will demonstrate explicitly how introducing a pandemic crisis variable into the monetary policy rule will affect the efficacy of monetary policy. Central banks may have to change how they pursue their mandates in the face of higher uncertainties (shocks) caused by the Covid-19 crisis. They cannot fundamentally change the long-run course of the economies. In that sense, they must ensure that the operationalisation of their mandates, as the way they define and pursue price stability, leaves no doubt that extremely low inflation is as much a concern to society as extremely high inflation.

Our results will therefore provide extra information on how central banks, by stabilising market conditions at a time of exceptional uncertainty and demand for safety, can pursue an expansionary (quantitative easing) programme that will be expected to act as an important circuit breaker that stops the pandemic from turning into a full-blown major economic crisis. In so doing, such monetary policies can save millions of jobs and businesses. Based on the 'expectations hypothesis' transmission channel, the explicit consideration of the pandemic event will provide solid support for the belief that expected real interest rates matter and that changes in inflation expectations can have real effects.

Hence, our results can help central banks to interpret their mandate and how they should conduct and communicate their operations in a way that credibly conveys their strong commitment to achieving price stability, while minimising any adverse consequences of its policies for society as a whole. These responses and challenges in the era of the Covid-19 pandemic should form important elements of their monetary policy strategy review. The outcome will be a framework that reflects their understanding of how the economy has changed since they conducted previous strategy reviews and ensure that monetary policy will continue to faithfully serve their economies.

The paper touches three strands in the literature. First, there is the literature on how the presence of natural disasters affects monetary policy decisions. Results from general equilibrium-type models (Isore and Szczerbowicz 2017; Fratzscher *et al* 2018) yield monetary policy responses with policy rates either increasing or decreasing in the aftermath of natural disasters. Second, there is the literature on how the presence of supply shocks affects monetary policy decisions. For supply shocks, the emphasis has been on oil price changes.

This literature includes Kilian (2009), Nakov and Pescatori (2010), and Kilian and Lewis (2011). Finally, there is the literature that explores the role of pandemics in the macroeconomy. There are very few studies of the impact of large-scale outbreaks of infectious diseases. More specifically, Meltzer *et al* (1999) examine the potential economic effects of the influenza pandemic in the US. Bloom *et al* (2005) use the Oxford economic forecasting model to estimate the economic impact of a pandemic resulting from the mutation of an avian influenza strain, whilst McKibbin and Sidorenko (2006) use a modelling approach to explore different pandemic influenza scenarios.

They find that the costs to the global economy can reach up to one trillion dollars for the scenarios considered. The findings of the present study are expected to provide monetary policymakers with strategies on the economic benefits of policy responses, particularly those of monetary policy. The central banks' responses will help to spread recession risks and reduce financial-system stress. In this context, the central banks' monetary policy goal should be to limit the fall in nominal GDP resulting from the Covid-19 shock, as well as the Covid-19 control efforts. Therefore, an updated monetary policy rule that explicitly considers the pandemic crisis can play a vital role in limiting the economic and financial damage caused by efforts to contain Covid-19 and, in that way, can help support the strict public-health measures that are needed to save lives and set the stage for economic recovery.

2. Methodology

The analysis uses a version of the framework recommended by Coibion and Gorodnichenko (2012) through the following monetary policy rule specification:

$$i_{ti} = a + b_{\pi} E_{t-}[\pi_{t+1,i-t+2,i}] + b_x x_{ti} + b_y \, ygap_{ti} + b_{cov} \, Covid19_{ti} + c \, DUM + \rho \, i_{t-1,i} \qquad (1)$$

where i_t is the policy rate, $\pi_{t+1,t+2}$ is the average of π_{t+1} and π_{t+2} forecasts, x_t is a supply/demand shock, ygap is the output gap, measured through the Hodrick and Prescott filter, and Covid19 is the proxy of the Covid-19 pandemic. The subscript i denotes the ith central bank, while DUM is a dummy variable capturing lockdown, social distancing, travel bans, and closed borders events, which correspond to disruptions in supply chains. This variable takes one for the months of March, April and May 2020, and zero otherwise.

The analysis additionally makes use of a supply factor and a demand factor, identified in previous studies: oil-supply recommended by Kilian (2009), and financial uncertainty recommended by Caldara *et al* (2016), based on the realised options implied volatility (VIX) index.

3. Data

The analysis estimates a panel of monetary rules in those OECD countries that experienced a significant number of Covid-19 cases, i.e. Australia, Austria, Belgium, Canada, France, Germany, Ireland, Israel, Italy, Japan, Korea, Netherlands, Spain, Sweden, Switzerland, Turkey, UK, and US. For Austria, Belgium, France, Germany, Ireland, Italy, Netherlands and Spain, the European Central Bank's framework is adopted. The time span under consideration is February 2020 to July 2020 where Covid-19 data are available, while data are on a monthly basis, totalling 108 observations. The realised VIX volatility data are obtained from DataStream. Output is measured as industrial production, while the forecasts of inflation and the output gap have been obtained from central bank sources, with oil prices and Covid-19 data also sourced from DataStream. Oil prices are measured as WTI closing spot prices. The analysis makes use of two types of Covid-19 data, confirmed incidences/cases and confirmed Covid-19 deaths.

4. Empirical Analysis

In the baseline case, we consider the number of incidences as the Covid-19 proxy. The regression makes use of the panel General Method of Moments (GMM) approach. The GMM methodology avoids potential endogeneity (i.e., reverse causality between inflation and policy rates, or output growth and policy rates) and is based on the approach recommended by Blundell and Bond (1998). It provides a robust Hansen J-test for the validity of instruments used, while the analysis makes use of the 'wild cluster bootstrap-t' method, which ensures the presence of robust cluster standard errors and t-statistics (Cameron *et al* 2008). Table 1 reports the estimated parameters of the policy reaction function. Specification (1) reports the parameter estimates of the unconditional policy monetary rule through the observed variables. Specifications (2) to (4) present the parameter estimates based on the structural shocks under consideration.

In specification (1), the long run response of inflation to the shocks considered is provided in the row $b_\pi/(1-\rho)$. The figure turns out to be 6.143, well above unity, suggesting that the central banks satisfy the Taylor inflation principle. The lag coefficient of the rule is 0.923, suggesting that the central banks implement monetary policy with a strong degree of gradualism. Next, we turn to the conditional specifications that consider the structural shocks under examination as acting separately.

F-tests illustrate the rejection of the null that the parameters are identical between the two alternative specifications. In addition, we can make the following observations: i) the pandemic shock clearly exerts a statistically significant negative effect on policy rates, ii) the long-run response to inflation always satisfies the Taylor principle, suggesting that central banks place a high value the role of the pandemic and financial events in their monetary policy reactions, iii) in the case of oil-supply shocks, the coefficient turns to be positive, albeit well below one, suggesting that the central banks place less emphasis on

Table 1: Monetary policy rules-GMM estimates:
the role of Covid-19 (number of incidences)

Parameters	(1)	(2)	(3)	(4)
$b_{\pi(t+1,t+2)}$	0.473***	0.588***	0.409***	0.496***
	[0.00]	[0.00]	[0.00]	[0.00]
b_{oil}	0.165**		0.181**	
	[0.03]		[0.02]	
b_{VIX}	–0.394***			–0.442***
	[0.00]			[0.00]
b_y	0.296**	0.234**	–0.054	0.173*
	[0.03]	[0.04]	[0.38]	[0.07]
b_{cov}	–1.219***	–1.248***		
	[0.00]	[0.00]		
c	–0.176***	–0.194***	–0.173***	–0.179***
	[0.00]	[0.00]	[0.00]	[0.00]
ρ	0.923***	0.918***	0.914***	0.920***
	[0.00]	[0.00]	[0.00]	[0.00]
$b_\pi/(1–\rho)$	6.143***	7.171***	4.756***	6.201***
	[0.00]	[0.00]	[0.00]	[0.00]
Adjusted-R^2	0.64	0.58	0.59	0.69
F-test	—	[0.00]	[0.00]	[0.00]
AR(2)	[0.47]	[0.51]	[0.49]	[0.55]
Hansen test	[0.58]	[0.64]	[0.61]	[0.59]
No. of obs.	108	108	108	108

Note: Figures in brackets denote p-values, while F-tests denote the p-value of the null hypothesis, which states that the parameters are identical to those of unconditionally estimated ones. Specification (1) considers the joint effect of all shocks and factors, Specification (2) considers only the Covid-19 factor, Specification (3) considers only the oil supply factor, Specification (4) considers only the financial volatility factor. AR(2) is the test for autocorrelation of order 2. Hansen is the test for the validity of instruments. As instruments, a number of lagged control variables were used. All estimations are performed with time dummies. *: p<0.10; **: p<0.05; *** p<0.01.

price stabilisation after oil-supply shocks, which confirms the arguments made by Bodenstein *et al* (2012) that monetary policies usually put less weight on oil-price inflation, iv) in terms of the pandemic shock, the coefficients are well above (minus) one, indicating the immediate response of monetary authorities, and v) the lockdown events are negatively associated with policy rates, showing that central banks pursued easy monetary policy to mitigate the disruptive effects of such events.

Finally, the results indicate the importance of Specification 1 versus Specifications 2 to 4, on the following grounds: i) Specification 1 is a complete modelling monetary policy rule approach in the sense that it considers the full spectrum of the economic (demand, supply and financial) shocks hitting the economy, ii) Specification 2 ignores the important role of oil supply shocks, iii) Specifications 3 and 4 ignore the role of the Covid-19 pandemic case, and iv) Specification 3 underestimates the impact on long-run inflation under certain structural shocks.

Table 2**:** Monetary policy rules-GMM estimates: the role of Covid-19 (number of deaths)

Parameters	(1)	(2)	(3)	(4)
$b_{\pi(t+1,t+2)}$	0.501***	0.612***	0.509***	0.496***
	[0.00]	[0.00]	[0.00]	[0.00]
b_{oil}	0.119**		0.131**	
	[0.05]		[0.04]	
b_{VIX}	–0.298***			-0.317***
	[0.00]			[0.00]
b_y	0.258**	0.226**	–0.054	0.173*
	[0.03]	[0.04]	[0.38]	[0.07]
b_{cov}	–1.298***	–1.336***		
	[0.00]	[0.00]		
c	–0.189***	–0.211***	–0.184***	-0.195***
	[0.00]	[0.00]	[0.00]	[0.00]
ρ	0.902***	0.927***	0.914***	0.898***
	[0.00]	[0.00]	[0.00]	[0.00]
$b_\pi/(1–\rho)$	5.112***	8.384***	5.919***	4.863***
	[0.00]	[0.00]	[0.00]	[0.00]
Adjusted-R^2	0.67	0.62	0.59	0.55
F-test	—	[0.00]	[0.00]	[0.00]
AR(2)	[0.53]	[0.55]	[0.53]	[0.58]
Hansen test	[0.62]	[0.68]	[0.64]	[0.62]
No. of obs.	108	108	108	108

Note: As in Table 1.

Table 2 repeats the estimates, but this time they consider as a proxy for Covid-19 the number of deaths that occurred. The results are similar to those reported in Table 1; however, in the case of the pandemic shocks they are even stronger, implying that death incidences have further stimulated the central banks to adjust their monetary policy rules against the pandemic event.

The next step of the empirical analysis makes use of the framework introduced by Coibion and Gorodnichenko (2012) as set out in Equation (1), to provide potential robust support to the previous findings. More specifically, we make use of an alternative specification based on the inertia in interest rates framework which reflects persistent monetary policy shocks (or persistent deviations from the Taylor rule) rather than just policy inertia. The new equation indicates monetary policy that follows the Taylor rule in Equation (1), but the shocks to the interest rate follow a persistent process:

$$u_t = \rho\, u_{t-1} + v_t \qquad (2)$$

Table 3: Monetary policy rules-GMM estimates: the role of Covid-19 (number of incidences) and persistent interest rate shocks

Parameters	(1)	(2)	(3)	(4)
$b_{\pi(t+1,t+2)}$	0.486***	0.602***	0.431***	0.511***
	[0.00]	[0.00]	[0.00]	[0.00]
b_{oil}	0.183**		0.202**	
	[0.02]		[0.02]	
b_{VIX}	–0.422***			–0.465***
	[0.00]			[0.00]
b_y	0.318***	0.258**	–0.079	0.197*
	[0.01]	[0.03]	[0.31]	[0.06]
b_{cov}	–1.244***	–1.267***		
	[0.00]	[0.00]		
c	–0.189***	–0.203***	–0.194***	–0.191***
	[0.00]	[0.00]	[0.00]	[0.00]
ρ	0.949***	0.935***	0.932***	0.948***
	[0.00]	[0.00]	[0.00]	[0.00]
$b_\pi/(1–\rho)$	9.721***	8.602***	6.610***	10.200***
	[0.00]	[0.00]	[0.00]	[0.00]
Adjusted-R^2	0.66	0.59	0.61	0.70
F-test	—	[0.00]	[0.00]	[0.00]
AR(2)	[0.49]	[0.55]	[0.52]	[0.57]
Hansen test	[0.60]	[0.67]	[0.64]	[0.60]
No. of obs.	108	108	108	108

Note: As in Table 1.

These results are reported in Table 3. They are very similar to those reported in Table 1. In particular: in Specification (1), the long run response of inflation to the shocks considered turns out to be 9.721, again well above one, suggesting that the central banks satisfy the Taylor inflation principle. The lag coefficient of the rule is 0.949, suggesting again that central banks implement monetary policy with a strong degree of gradualism.

The F-tests document the rejection of the null that the parameters are identical between the two alternative specifications, while the pandemic shock clearly exerts a statistically significant negative effect on policy rates; the long-run response to inflation always satisfies the Taylor principle, suggesting that the central banks place a high value the role of the pandemic and financial

Table 4: Monetary policy rules-robust GMM estimates: the role of Covid-19 (number of incidences) under alternative specifications

Parameters	(1)	(2)	(3)	(4)
$b_{\pi(t+1)}$	0.529***		0.484***	0.546***
	[0.00]		[0.00]	[0.00]
$b_{\varpi t}$		0.503***		
		[0.00]		
b_{oil}	0.197**	0.211***	0.218***	0.216***
	[0.02]	[0.01]	[0.01]	[0.01]
b_{VIX}	-0.437***	-0.435***	-0.449***	-0.474***
	[0.00]	[0.00]	[0.00]	[0.00]
b_y	0.329***	0.289***		
	[0.00]	[0.01]		
$b_{y(t+1)}$			0.310***	
			[0.00]	
b_{cov}	-1.269***	-1.283***	-1.281***	-1.304***
	[0.00]	[0.00]	[0.00]	[0.00]
c	-0.196***	-0.214***	-0.199***	-0.225***
	[0.00]	[0.00]	[0.00]	[0.00]
ρ	0.943***	0.940***	0.938***	0.955***
	[0.00]	[0.00]	[0.00]	[0.00]
$b_\pi/(1-\rho)$	8.820***	8.381***	8.071***	10.920***
	[0.00]	[0.00]	[0.00]	[0.00]
Adjusted-R^2	0.68	0.67	0.69	0.61
AR(2)	[0.53]	[0.58]	[0.57]	[0.60]
Hansen test	[0.63]	[0.65]	[0.62]	[0.63]
No. of obs.	108	108	108	108

Note: As in Table 1.

events in their monetary policy reactions; in terms of oil-supply shocks, the coefficient turns to be positive again, albeit well below one, suggesting that the central banks place less emphasis on price stabilisation after oil-supply shocks; in terms of the pandemic shock, the coefficients are well above (minus) one, indicating the immediate response of monetary authorities; finally, the lockdown events are negatively associated with policy rates, showing that central banks pursued easy monetary policy to mitigate the disruptive effects of such events.

Finally, Table 4 presents additional robust results for different specifications of the Taylor rule. For example, using the forecast of inflation in the next quarter rather than in the next two quarters (Specification 1) does not affect our findings. Next, Specification 2 assumes how a central bank responds to the forecast of the current quarter's inflation rate. Similarly, allowing for a response to expected output growth in the next quarter rather than the current quarter (Specification 3), or eliminating the response to output growth altogether (Specification 4), across all four specifications, lead to similar conclusions about the role of Covid-19 cases as those reported in the previous tables.

5. Conclusion

This paper provides estimates of the monetary policy rule when the Covid-19 shock is explicitly treated separately from other potential shocks that may have impacted policy rates. The analysis of a sample of OECD countries, spanning the period February 2020-July 2020, has highlighted that the long-run response to inflation exceeded 1 for the pandemic event, suggesting that central banks implement monetary policy fulfilling the Taylor principle, while they explicitly consider the impact of the pandemic shock in the manner by which they reach monetary policy decisions.

The findings clearly indicate that the central banks did whatever they were supposed to do to stimulate their economies, by cutting their policy rates. If the pandemic will generate more deaths, or something goes unexpectedly wrong with the vaccines, the big question is whether we should be expecting central banks to cut the policy rates further, to negative levels. The critiques on the presence of negative interest rates, especially for commercial banks, as well as central banks facing the challenge in the presence of fundamental uncertainty, that they cannot use traditional tools to acquire confidence in their decisions, suggest that potential recommendations lie elsewhere. These point to broader responses to combat the effect of uncertainty on aggregate demand and the economy, by deploying unconventional devices such as massive purchases of longer-term treasury bonds and excessive liquidity bailouts, with central banks intervening in the foreign exchange markets by smoothing the depreciations to curb inflation, given the intimate relationship between changes in the exchange rate and inflation.

These measures could gradually lead to economic recovery. Moreover, the impact of the pandemic on inflation can motivate central banks to redefine their price stability objectives as a specific fixed target rather than a 'below or close to' target. The benefit of a clear objective is that it is easy to communicate. In addition, central banks then have the opportunity to establish a tolerance band around their inflation targets. Explicit bands are a tool for communicating what levels of inflation are tolerable. Given the explicit nature of these bands, achieving those outcomes establishes credibility, which in turn helps the central banks to achieve their objectives more easily.

Therefore, in periods of high uncertainty associated with the pandemic crisis, monetary policymakers can afford to permit wider inflation bands in their monetary policy rules. Finally, the results may also imply that it is important to acknowledge that the nature of central bank communication also needs to change when uncertainty is high. Uncertainly means less knowledge about the future. Communication then is less about what will happen, which by definition is less known, and more about what the reaction should be if alternative scenarios happen.

Accepted for publication: 26 January 2021

Endnote

1. Nicholas Apergis, University of Texas at El Paso. Email: napergis@utep.edu

References

Bloom E, Wit V D and Jose M J C S (2005) 'Potential economic impact of an avian flu pandemic on Asia', ERD Policy Brief Series, No. 42. Asian Development Bank.

Blundell R and Bond S (1998) 'Initial conditions and moment restrictions in dynamic panel data models', *Journal of Econometrics*, 87, 115-143.

Bodenstein M, Guerrieri L and Kilian L (2012) 'Monetary policy responses to oil price fluctuations', *IMF Economic Review*, 60, 470-504.

Caldara D, Fuentes-Albero C, Gilchrist S and Zakrajsek E (2016) 'The macroeconomic impact of financial and uncertainty shocks', *European Economic Review*, 88, 185-207.

Cameron C A, Gelbach J B and Miller D L (2008) 'Bootstrap-based improvements for inference with clustered standard errors', *Review of Economics and Statistics*, 90, 414-427.

Coibion O and Gorodnichenko Y (2012) 'Why are target interest rate changes so persistent?', *American Economic Journal: Macroeconomics*, 4, 126-162.

Fratzscher M, Grosse Steffen C and Reith M (2018) 'Inflation targeting as a shock absorber', DIW Discussion Paper, No. 1721.

Isore M and Szczerbowicz U (2017) 'Disaster risk and preference shifts in a new Keynesian model', *Journal of Economic Dynamics and Control*, 79, 97-125.

Kilian L (2009) 'Not all oil price shocks are alike: disentangling demand and supply shocks in the crude oil market', *American Economic Review*, 99, 1053-1069.

Kilian L and Lewis L T (2011) 'Does the Fed respond to oil price shocks?', *The Economic Journal*, 121, 1047-1072.

McKibbin W and Sidorenko A (2006) 'Global macroeconomic consequences of pandemic influenza', Lowy Institute Analysis, Australian National University.

Meltzer M I, Cox N J and Fukuda K (1999) 'The economic impact of pandemic influenza in the United States: priorities for intervention', *Emerging Infectious Diseases*, 5, 659-671.

Nakov A and Pescatori A (2010) 'Monetary policy trade-offs with a dominant oil producer', *Journal of Money, Credit, and Banking*, 42, 1-32.