Do Unconventional Monetary Policy Measures Make a Difference?

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ABSTRACT

The COVID-19 pandemic has served as a turning point for central banks in the formulation of their monetary policy in achieving its core mandates. Central banks (CBs) can often act far faster than other institutions and pass policies that can keep the economy buoyant amid harsh economic conditions. Traditionally, CBs have used their main policy tools to address potential hurdles during times of crisis such as a lack of domestic liquidity, heightened possibility of bank runs, crashing financial markets, and a higher cost of borrowing. These main policy tools come in the form of rate cuts, reserve requirement cuts, and exceptions, and other similar measures. However, COVID-19 presents a huge challenge as it impacts the real economy directly, affecting the supply and demand side substantially with a recovery that is pegged as slow for the remainder of the year. As such, the BSP and other CBs have had to go beyond the traditional ambit of policy tools and venture with other policies that may be unconventional but may quell unrest in the financial markets. This study aims to determine the causal impact of unconventional policy decisions made by the BSP on key financial market variables. It was determined that the unconventional policies done by the BSP were able to lower the rate of borrowing among banks as well and increase investor confidence in the return performance of Philippine bonds. In contrast, this study finds that unconventional policies have no significant causal impact on the equities market and the FX market.

Keywords. Unconventional Monetary Policy, Time Series Causality, Bayesian Econometrics

JEL Classification.

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Introduction

The recent COVID-19 pandemic has forced central banks to rethink the effectivity of their policy tools in terms of dealing with a crisis that directly affected the real economy. Many economists believe that the impact of the pandemic will be far longer lasting than the impact of the recent global financial crisis (GFC) prompting a proper rethink about the conduct of economic policy. What is evident is that most government institutions and central banks have approached this pandemic in very similar regard to how they responded to the GFC. That is, relying on their existing policy tools and other fiscal measures to keep the economy buoyant in turbulent times. However, to alleviate what is considered by many to be predominantly a health crisis, unconventional policy tools may prove to be more effective. Regardless, the need to reinforce confidence in the ability of a country to provide enough liquidity and to ensure a lower cost of borrowing is imperative for an economic recovery.

This study aims to see if the initial unconventional policy measures done by the BSP have had some causal effect on easing the financial markets. By an easing, this means that banks are more likely to lend to the public, the equities market has recovered slightly and has lower volatility, and general confidence in the future of the financial markets is felt. This paper makes use of an analysis that seeks to determine the causal impact of policy action, in this case, the announcement of BSP's asset purchases from the Bureau of the Treasury, which is outside the traditional ambit of policy responses the BSP uses. This method follows Brodersen et al. (2015) which generalizes the typical difference-in-difference frameworks on time series by directly modeling the counterfactual scenario before and after the intervention in a pure Bayesian estimation of the average treatment effect and a model averaging framework to produce the most appropriate counterfactual estimate using synthetic controls.

In this study, the goal is to ascertain whether key financial market variables had eased off post the measures of the BSP. The financial market variables implored will be the Philippine Stock Exchange index (PSEi) to represent the equities market, the USD/Php Exchange Rate to represent the foreign exchange market, the Interbank Call Loan Rate (IBCL) to represent the cost of borrowing, and the JP Morgan Emerging Bond Market Index for the Philippines (EMBI-PH) to represent the bond market. A description of each variable is seen in *Table 1*. These variables were selected as they are key indicators typically looked at when assessing domestic financial conditions and future outlooks. Understanding the causal impact of unconventional policy actions is crucial to the long-term conception of the BSP on the effectivity of unconventional policy actions, especially during times of economic crisis wherein policy becomes crucial.

Financial Market Variable	*Description*
Daily Interbank Call Loan Rate (IBCL)	The IBCL, reported by the BSP, measures the rate at which banks lend to other banks and quasi-financial institutions. The higher the IBCL, the higher the rate of borrowing between banks which may serve as a proxy as to the borrowing rate in the economy.
Philippine Stock Exchange Index (PSEi)	The PSEi composite index measures the overall performance of Philippine publicly traded firms inside the PSEi index. The higher the closing price, the better the performance and outlook on Philippine publicly listed firms.
US Dollar/ Philippine Peso Exchange Rate	The USD/Php exchange rate measures the value of the US Dollar converted to Philippine peso at a given time. If the value is higher, it suggests that the Peso is depreciating against the dollar. The converse implies that the Peso is appreciating when the value is lower.
J.P. Morgan Emerging Market Bond Index (Philippines)	The JP Morgan EMBI for the Philippines measures the return performance of international government or corporate bonds which originate from emerging market economies. The higher the EMBI, the higher the expected return performance of these types of bonds.

Table 1. *Variable Descriptions*

The paper is divided as follows. The second section gives a brief overview of the methodology used which follows the state-space Bayesian formulation of Brodersen et al. (2015). This starts by introducing the model, the covariates used, and some time-series factors that are accounted for. The third section discusses the results obtained from each variable and the key takeaways obtained from the causal impact simulation. The last section concludes the paper and gives policy recommendations.

Methodology

This paper uses a diffusion-regression state-space model akin to the specification of Brodersen et al. (2015) in measuring the causal impact of the BSP's asset purchases on key economic variables. This methodology allows for the quantification of a counterfactual estimate in a synthetic control environment which estimates the value that variables would take had no asset purchase policy been implemented by the BSP. The section starts with an overview of measuring the causal impact and the traditional methods that have been used to estimate this. A discussion on how the approach is modified for use in this study follows as well as the structure of the model employed.

Conventional Causality Estimation

Determining the causal impact of any policy is difficult econometrically to estimate but serves as a valuable indicator for the effectiveness of a particular policy decision. Traditionally, causal impact estimates are obtained through the use of randomized control trials (RCTs) or randomized experiments as those used in studies by Duflo (2007, 2009) and Banerjee (2009). In these studies, through the use of randomization and a controlled setting, the potential outcomes can be properly estimated and the average treatment effect, which is often regarded as the causal impact of an intervention. While this method is commonplace in estimating causal impact, the applicability of the methodology in the context of central bank policies is difficult[1]. Moreover, the method is usually applied in the context of panel data and not on a purely time series implementation.

Other studies employ the use of a Difference in Difference (DID) framework. However, the DID framework is deficient in a time series setting and has a couple of inherent limitations. The limitations raised by Brodersen et al. (2015) include the static-ness of the regression model which assumes that the data is identically and independently distributed, the focus on only two inherent periods (pre and post-treatment), and the way synthetic controls have been constructed for DID implementations on purely time series data[2]. To overcome the limitations of the DID framework, a state-space model with a highly flexible regression component may be utilized to explain the temporal evolution of an observed outcome.

Constructing the Counterfactual

In constructing a counterfactual, Brodersen et al. (2015) referred to the creation of synthetic controls akin to Abadie, Diamond, and Hainmueller (2010). A synthetic control is formulated by grouping candidate predictor variables into a single synthetic control. In selecting the candidate predictor variables, the main consideration should be the predictive power of the series before the intervention being measured. Moreover, the candidate predictor variable, henceforth known as covariates, should not be affected by the treatment assignment. In the case of this study, the covariates should not be affected by the BSP's asset purchases. While the basis of the selection is on pre-treatment characteristics, the value in their use lies in their behavior post-treatment in estimating the counterfactual. For this study, the Chicago Board of Equities Exchange VIX index and the US 10 Year Bond yield are used as covariates. This is because the trend of all the variables should be roughly similar pre-intervention when the market was at the status quo and no major effects from COVID had affected the financial markets. Post-intervention, we can rationalize that the BSP's asset purchases had no impact on these covariates due to the relative size of the Philippine market

[1] There are ethical considerations, difficulties in controlling for unobservable events, and violations in the stable unit treatment value assumption.
[2] Strategies are listed in Brodersen et al. (2015) include Abadie, Diamond, and Hainmueller (2010), and Abadie and Gardeazabal (2003).

and its significance to affect US financial markets. Moreover, the responses of the BSP were generally earlier than the US FED as the spike in cases for the US happened later than that of the Philippines for the sample period in review.

Model Formulation

The static state-space model can be defined into a pair of equations as in Brodersen et al. (2015). These equations are the observation equation *(Equation 1)* and the state equation *(Equation 2)*.

$$Y_t = Z_t'\alpha_t + u_t \tag{1}$$

$$\alpha_{t+1} = T_t\alpha_t + R_t\eta_t \tag{2}$$

The observed values of the financial market variables Y_t where $t = 1, \dots, T$ can be modeled as the result of a hidden state (not yet realized) in addition to some error term. The state coefficientα_t contains a local level μ_t, and local linear trend δ_t, and the covariates which can affect the observed values contemporaneously[3]. The regression component of the state space model must enable the estimation of synthetic counterfactual predictions. Ensuring this assumption is met requires that the treatment being observed does not affect the covariates being used, otherwise a risk of overestimation or underestimation is highly probable.

Ensuring that covariates are unaffected by the treatment assignment is important to be able to estimate a representative counterfactual. In this specific approach, the traditional way of incorporating covariates in the model is by including it as some linear term Z_t through the use of linear regression. This is written in state-space form as $Z_t = \beta' x_t$ where $\alpha_t = 1$. In this format, the covariates are assumed to be contemporaneous which suggests that the current model cannot infer on a potential lag between the series that was "treated" and that which was not. That contemporaneous assumption is relatively believable in our study as the effects of COVID on the financial markets have roughly been the same across the global financial markets with all experiencing huge declines at roughly similar periods.

In a fully Bayesian approach, the inference of posterior expectations can be done by first simulating draws of the model parameters and the state vector α contingent on observed data in the training period. After this, the posterior simulations are used to derive the posterior predictive distribution which is given as $P(\tilde{Y}_{n+1:m}|Y_{t:n})$ over the counterfactual series which is $\tilde{Y}_{t+1:T+h}$ contingent upon the observed series $Y_{t:n}$. Note that this is the observed series prior to the intervention at time n. Subsequent periods after the intervention denote periods $n + 1$ until m. Using these posterior samples, the pointwise impact which is

[3] A detailed discussion of the methodology is in Brodersen et al. (2015)

$Y_t - \widetilde{Y}_t$ can be obtained for all t. The respective samples for the posterior predictive distribution over the counterfactual can be used to obtain samples from the causal effect from the posterior distribution. This is given in *Equation 3*. In this equation, each sample draw τ can have an impact estimate γ_t which is the difference between the observed value and the counterfactual value.

$$\gamma_t^{\tau} = Y_t - \widetilde{Y}_t^{\tau} \tag{3}$$

Note that this difference corresponding to the impact estimate is obtained for all periods from $n + 1$ or after the intervention had taken place until time m which is the last period of the intervention sample.

Results and Discussion

This section discusses the results from the causal impact estimations done on the financial market variables. Each causal impact estimation is discussed with underlying reasons as to the results discussed. The section concludes with a summary table highlighting key results leading up to potential policy responses that could be taken in light of these results.

On the Interbank Call Loan Rate

The Interbank Call Loan Rate is the rate at which banks borrow and lend in the Interbank Call Loan market. In general, this follows the policy rate set by the BSP closely and an increase or decrease in the rate generally reflects fluctuations on the willingness of banks to lend out funds to consumers.

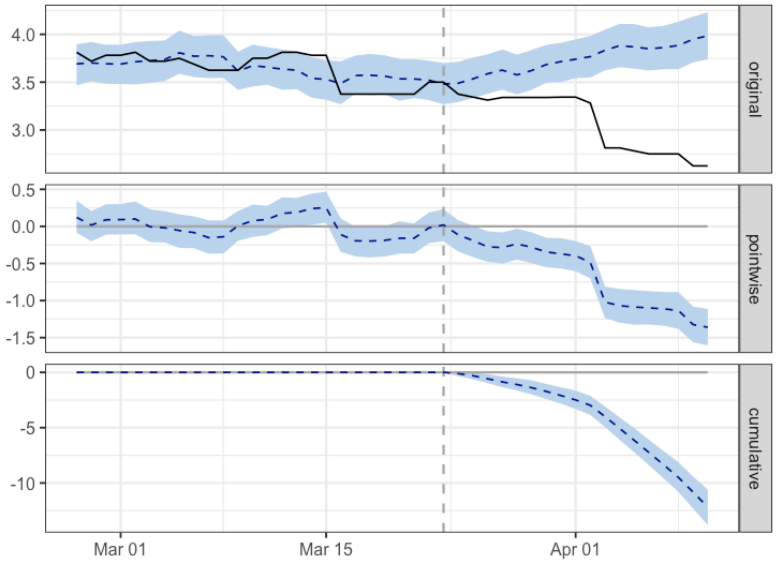

Figure 1. *Causal Impact on the Interbank Call Loan Rate*

In *Figure 1*, the causal impact of the BSP's asset purchases can be seen. The figure has three panes, namely, (1) original, (2) pointwise, and (3) cumulative. The study is only concerned with the first two panes as the third pane is non-sensical for rate reductions.

In the original pane, both the actual series in black and the estimated counterfactual of the series in the dashed blue line are shown. The counterfactual the forecasted value that the IBCL would have taken had the BSP not done the asset purchases from the Bureau of the Treasury. In the second pane, which is the pointwise series, the general trajectory, and the fall of the BCL post the asset purchases can be observed. First, it is easy to see that the general appearance of the observed series and the synthetic counterfactual are similar pre-intervention. Second, during the post-intervention period, the IBCL had an average value of 3.07. By contrast, in the absence of an intervention, an expected average response of 3.75[4] was realized. Subtracting this prediction from the observed response yields an estimate of the causal effect the intervention had on the response variable. This effect is -0.68 suggests a reduction of about 68 basis points in the IBCL. The above results are given in terms of absolute numbers. In relative terms, the response variable showed a decrease of -18%[5]. This means that the negative effect observed during the intervention period is statistically significant. Third, the probability of obtaining this effect by chance is very small[6]. This means the causal effect can be considered statistically significant.

The significant decline in the IBCL suggests that the policy measure of the BSP was able to lower borrowing rates, likely easing domestic liquidity concerns and giving reassurances that there will be enough money to accommodate lending and borrowing even in a pandemic.

On the Philippine Stock Exchange

The equities market was severely affected by the pandemic as supply-side shocks amplified by demand-side restrictions caused stocks to plunge. As the quarantine restrictions came in, the stocks were battered as the short-term outlook of publicly listed firms were not optimistic as cases kept increasing. Interestingly, the equities markets across different countries in South East Asia generally followed a similar trend with most markets diving on the onset of quarantine restrictions and rebounding modestly after the fact.

In *Figure 2*, the causal impact of the policy intervention of the PSEi is shown. The effect is counterintuitive to what was expected and was not statistically significant based on the estimation.

[4] The 95% interval of this counterfactual prediction is [3.66, 3.84].
[5] The 95% interval of this percentage is [-20%, -16%].
[6] Bayesian one-sided tail-area probability p = 0.001

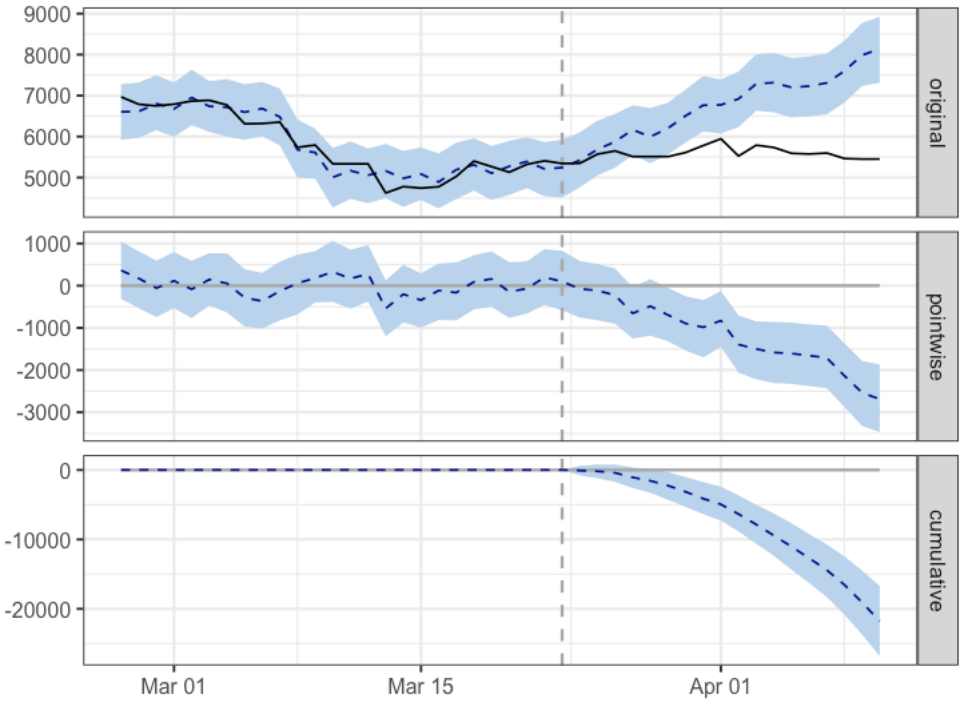

Figure 2. *Causal Impact on the PSEi Composite Index*

During the post-intervention period, the response variable had an average value of approximately 5,590. By contrast, in the absence of an intervention, we would have expected an average response of 6,800[7]. Subtracting this prediction from the observed response yields an estimate of the causal effect the intervention had on the response variable. This estimated effect is a reduction of 1,210 in the PSEi composite index. In relative terms, the response variable showed a decrease of -18%[8].

The decline in the PSEi post the intervention is likely due to the prolonged lockdown which has had a considerable impact on the equities market. While the BSP's policy is indirectly supported for the equities market, it is not the direct solution as it will not alter how quarantine conditions affecting the demand and supply side. This is likely the reason as to why the overall effect on the equities market had been insignificant.

On the Foreign Exchange Rate

The Philippines, during the height of the pandemic, stuck to a relatively status quo exchange rate management system which is largely market-determined. In the same period, the government had been stocking up on loans, generally from foreign agencies denominated in US dollars. While most ASEAN nations experienced a depreciation vis-à-vis the US dollar, the Peso appreciated for the most part.

[7] The 95% interval of this counterfactual prediction is [6.52K, 7.08K].
[8] The 95% interval of this percentage is [-22%, -14%]

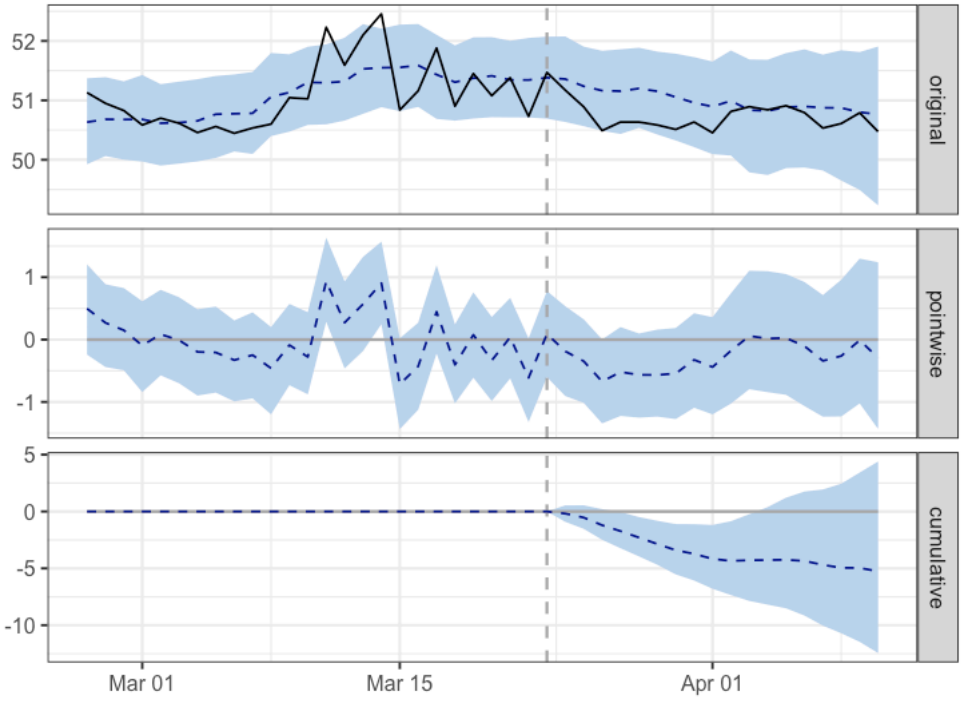

Figure 3. *Causal Impact on the Exchange Rate*

During the post-intervention period, the exchange rate had an average value was pegged at approximately Php 50.70/$1. In the absence of an intervention, we would have expected an average response of Php 51.00/$1[9]. Subtracting this prediction from the observed response yields an estimate of the causal effect the intervention had on the response variable. This average treatment effect is a decline of Php 0.29. In relative terms, the exchange rate showed a decrease of -1%.

This means that, although it may look as though the intervention has exerted a negative effect on the response variable when considering the intervention period as a whole, this effect is not statistically significant, and so cannot be meaningfully interpreted. For one, the estimated impact lies on both positive and negative ends of the confidence interval which suggests that the impact is minuscule at best or may take a positive or negative sign. The apparent effect could be the result of random fluctuations that are unrelated to the intervention. This appreciation of the Philippine peso would likely be due to factors outside the BSP's asset purchases such as the exchange rate management, treasury management and operations, and other monetary operations not part of the unconventional policy being evaluated[10].

[9] The 95% interval of this counterfactual prediction is [50.46, 51.39].
[10] This is generally the case when the intervention period is too short to distinguish the signal from the noise.

On the Emerging Market Bond Index

At the height of the pandemic, government yields, especially in emerging markets, decline significantly as investors fled to safer shores. As risk appetite quelled amid growing uncertainty, long term government bond yields continued to decline as investors reallocated investments to shorter-term bonds and safer bond territories.

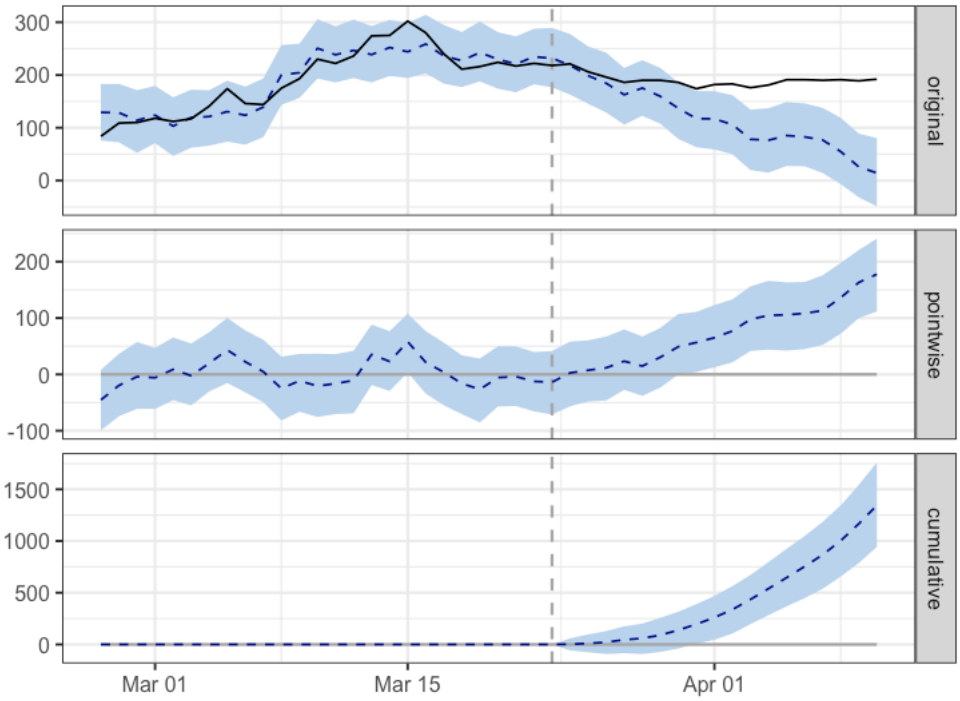

Figure 4. *Causal Impact on the Emerging Market Bond Index for the Philippines*

After the implementation of the policy, the EMBI-PH had an average value of approximately 189.72 basis points. By contrast, in the absence of an intervention, the expected average value of the EMBI was 115.06[11]. This suggests that the impact of the asset purchases is 74.67 basis points. In relative terms, the response variable showed an increase of 65 percent[12]. This positive response was expected as central bank actions to quell financial market fears and domestic liquidity concerns may potentially ease investors' risk aversion and prompt them to retain current bond holdings and not to vacate emerging market bonds over more developed economy offerings.

It was also deduced that the positive effect observed during the intervention period is statistically significant and unlikely to be due to random fluctuations. The probability of obtaining this effect by chance is very small[13] which means the causal effect can be considered statistically significant.

[11] The 95% interval of this counterfactual prediction is [92.03, 137.26]
[12] The 95% interval is at 46 percent and 84 percent
[13] Bayesian one-sided tail-area probability p = 0.001

Conclusion and Recommendations

Ascertaining the impact of unconventional monetary policy is crucial in the debate over the formulation of monetary policy, especially during unprecedented times. While it is clear that the BSP's approach to achieving its mandates may still be mostly due to its main policy responses, it is clear that the unconventional monetary policy moves done by local bourse was able to ease some financial market uncertainty.

With the financial market variables under consideration, there is empirical evidence as to the causal impact of the BSP's asset purchases on the bond market and the interbank call loan market. It appears that the unconventional policy action was able to lower rates in the interbank call loan market suggesting a reduced cost of borrowing and an easing up of the initial tightening of market rates due to liquidity concerns. Similarly, the bond market, as measured by the EMBI, increased post the asset purchases suggesting an increase in the returns performance of Philippine bonds and a quelling of investor risk aversion towards emerging market fixed income securities. On the flipside, no statistical causal impact was seen in the equities and FX market, owing primarily to the reliance of these indicators on supply-side factors and trade which may not be directly addressed by the unconventional policy.

Overall, the conduct of unconventional monetary policy is important, and understanding what specific benefits these policies could end up doing is crucial during crisis periods in achieving the BSPs core mandates. To be able to conduct unconventional monetary policy, the central bank must have the leeway to be able to execute certain provisions that may have certain requirements.

Strengthening Macroeconomic Buffers and Fundamentals. While not directly an unconventional monetary policy, having ample macroeconomic buffers may allow the undertaking of larger-scale unconventional monetary policies which could prove to be useful in easing financial market concerns during crisis periods.

Developing an Unconventional Monetary Policy Strategy Framework. Similar to actions being done towards Macroprudential Policy and the monitoring of systemic risks, central banks should explore the possible unconventional monetary policies that could be implemented should the need arise. While the need for unconventional policy hasn't been in the spotlight due to lack of necessity, the recent pandemic has forced a rethink of the policy tools within the ambit of a central bank and the need to be prepared with an adequate policy response given the unique flexibility of central banks during crisis periods.

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