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ANG PAPER NA ITO AY SALAPING UNITRAL SA PILIPINAS AT PAMBAYAD SA LAHAT NG URI NG PAGKAKAUTANG

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Heterogeneity in Responses of Inflation to Monetary Policy in the Philippines

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ABSTRACT

Neil Fidelle G. Lomibao^a

Central banks are among the institutions at the forefront of addressing the impact of the Coronavirus Disease 2019 (COVID-19) pandemic on certain aspects of the economy. With inequality seen to rise due to the ongoing crisis, it is important to understand how monetary authorities can create sound policies to aid in tackling this issue. Using a Vector Autoregression (VAR) and Bayesian Regression models, this paper shows that monetary policy affects inequality through its influence on Headline Inflation and the Bottom 30% percent Income Household Inflation. Aside from different structural policies that are needed to address this issue, maintaining low and stable inflation, and implementing equitable “non-monetary” policies across different income households can help mitigate the inflation aspect of inequality in the Philippines.

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Keywords : inequality, monetary policy, inflation, COVID-19, household, Philippine economy, bottom 30 percent, low income, poverty

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1. Introduction

The Coronavirus Disease 2019 (COVID-19) pandemic created a huge and unequal impact on the economy. It created the worst annual contraction since 1947 (Philippine Statistics Authority, 2020). More than a year since the onset of this crisis, varying levels of economic recovery are also being observed across different countries and communities. United Nations in the Philippines (2020) noted that economic scarring is predicted to be more prominent in vulnerable population groups and industry sectors that were unable to fully adapt to the new economic arrangement that the virus has brought.

However, given the novel situation of this crisis, only a few studies have been conducted about inequality. Most have been reliant on the standard definition of inequality using income or wealth, thereby, creating years of lag to produce timely data analysis and policy recommendations. And with the virus projected to become endemic and produce lasting effects, different institutions are urged to develop innovative ways to better understand this pandemic; and provide more proactive responses to better protect the overall health of the economy and the people.

Central banks, which are at the forefront of maintaining economic stability during these times, are also among the institutions that are seen to help address some of the resulting growing concerns. According to the BIS Annual Economic Report 2021, while economic inequalities are best addressed by fiscal and structural policies, central banks can help in this issue in shorter horizons by keeping inflation low and maintaining macroeconomic and financial stability. At the same time, it can also wear its “non-monetary hats” to help mitigate economic inequality such as becoming promoters of financial development and inclusion, and guardians of payment systems.

This paper attempts to analyze the possible dissimilar or “unequal” responses of the Consumer Price Index (CPI) of Headline and Bottom 30% Income Households to monetary policy. The analysis involves modifying the simple vector autoregression (VAR) model developed by Cabote and Fernandez (2019) in studying the distributional impact of monetary policy in the Philippines. Using these two inflation variables, it can be a reasonable way to hypothesize the effects of monetary policy on the average and low-income Filipino households, respectively.

The effect of inflation on the disposable income of households has been seen as the indirect connection of central banks to influence inequality (BIS, 2021). While monetary policy is a blunt instrument (i.e., it cannot selectively affect a particular region, industry, or specific income group), Cabote and Fernandez (2019) highlighted that the distributional impact of monetary policy through the inflation channel in the Philippines possibly varies across different income households. Thus, it can be a valuable insight to understand the possible responses of the different income households inflation relative to the policy rates implemented by the central bank across time.

Establishing a clearer understanding of the relationship between household inflation and policy rates would enable central banks to identify areas where monetary and “non-monetary” policies can be improved to balance their impact, including those on the issue of inequality. At the same time, by grasping the relationship between these variables, central banks can more deeply understand how they could better provide more equitable policies especially for those at the peripheries of the society.

2. Stylized Facts

The Philippine Statistics Authority (PSA) has been releasing Consumer Price Index (CPI) data from two types of households since 2012. The Headline CPI essentially represents the changes in price levels of goods and services of an average Filipino household and the Bottom 30 percent Income Household (BIH) CPI which is associated with low-income families.

Table 1. Expenditure Pattern between different Income Groups in the Philippines

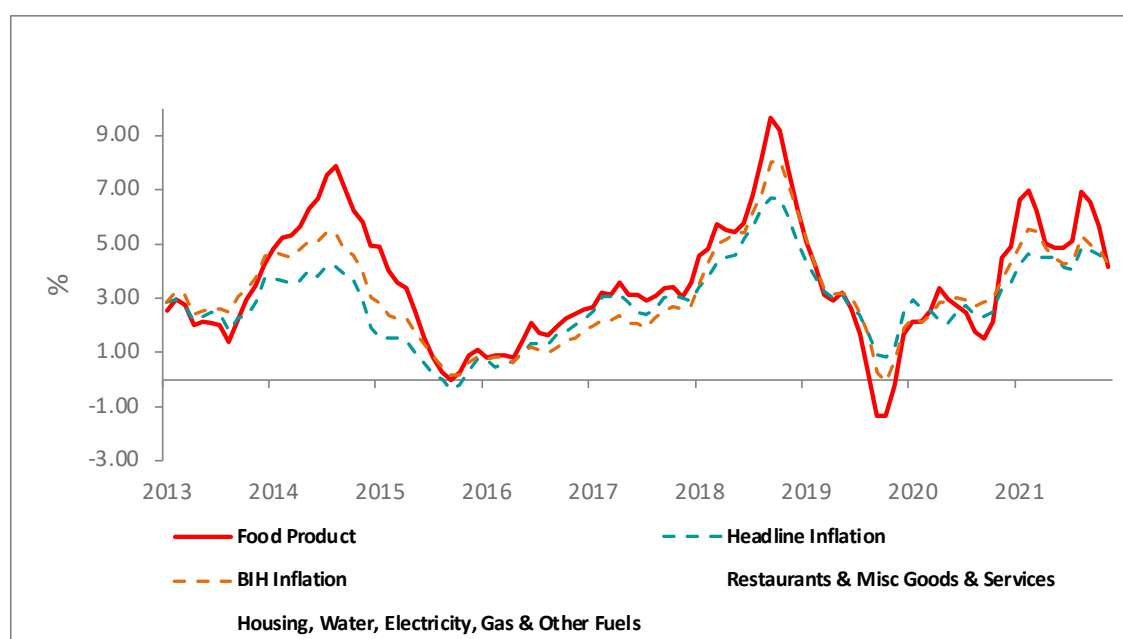
Expenditure Items	All Income Groups	Bottom 30%	Upper 70%
Total Expenditure (In billion pesos)	5,906	956	4,950
Percent	100.0	100.0	100.0
Food Expenditures	42.6	58.2	39.5
Alcoholic Beverages	0.6	0.7	0.5
Tobacco	1.2	1.7	1.2
Other Vegetable-Based Products	0.0	0.0	0.0
Clothing and Footwear	2.5	2.3	2.6
Furnishings and Routine Household Maintenance	2.3	2.0	2.3
Health	2.7	1.4	3.0
House Rent/Rental Value	12.2	8.1	12.9
Water, Electricity, Gas and Other Fuels	8.2	7.6	8.3
Transport	6.6	5.2	6.9
Communication	2.2	0.9	2.4
Recreation and Culture	0.7	0.6	0.8
Education	2.6	1.5	2.8
Hotels (Accommodation Services)	0.2	0.1	0.2
Miscellaneous Goods and Services	6.6	5.3	6.8
Durable Furniture and Equipment	3.5	1.6	3.9
Special Family Occasions	2.8	2.0	3.0
Other Expenditure	2.5	0.6	2.9

Sources: Philippine Statistics Authority, 2018 Family Income and Expenditure Survey

One of the main characteristics of low-income households is that food commodities make up a relatively large portion of their total expenditure (Table 1). This puts low-income households in a vulnerable position when sudden price changes of food occur and would have a greater impact on them than any other group. In 2021 alone, the rise in food prices due to the negative impact of African Swine Fever (ASF) and tropical storms became the main driver of both the Headline and BIH Inflation (PNA, 2021). Generally, Food Product Inflation is more volatile and higher than the Headline, BIH, and Non-Food Inflation numbers (Figure 1).

Another characteristic of low-income households is that they spend less on non-food items than the rest of all income groups. Productivity growth gained from technological advancement brought by non-food products such as those included in Transport, Communication, Durable Furniture and Equipment (i.e. automation, ease of transporting goods, faster communication and transactions) might elicit minute effects to poor families since they spend less on these commodities. This is particularly important during this COVID-19 pandemic wherein consumers rely more on technology to participate in a digitally-driven economy.

Figure 1. Food Product Inflation vis-à-vis Headline, BIH, and inflation of selected commodities with high weights in the basket of goods of a Filipino household

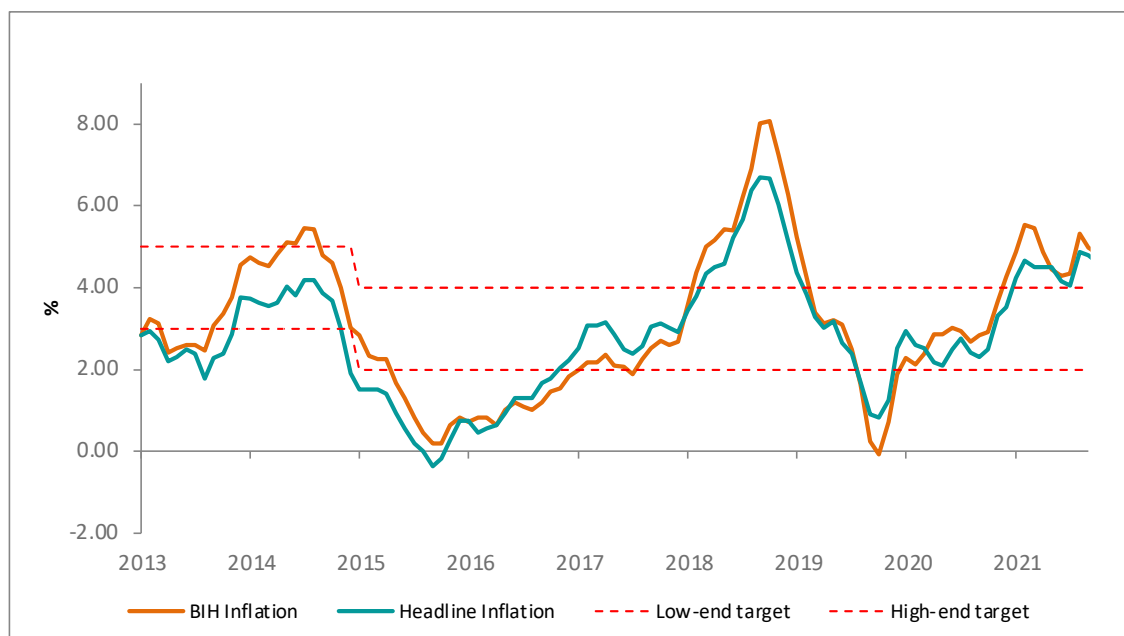


Sources: Philippine Statistics Authority, CEIC

Historically, BIH Inflation is generally higher than Headline Inflation (Figure 2). It can also be observed that during the sustained increase in prices due to changes in policy or market conditions, the inflation of low-income households at times remains elevated before it converges with headline inflation, and subsequently declines to levels that are lower than the headline inflation. The constant high inflation reading on food items can be considered to influence such observation about BIH Inflation. This was, for instance, seen

when the Bangko Sentral ng Pilipinas (BSP) raised the policy rate during the recent tax reform period, when inflation rose due to the new taxation policy, increase in oil prices, and devastation of crops from tropical storms recorded between 2018-2019.

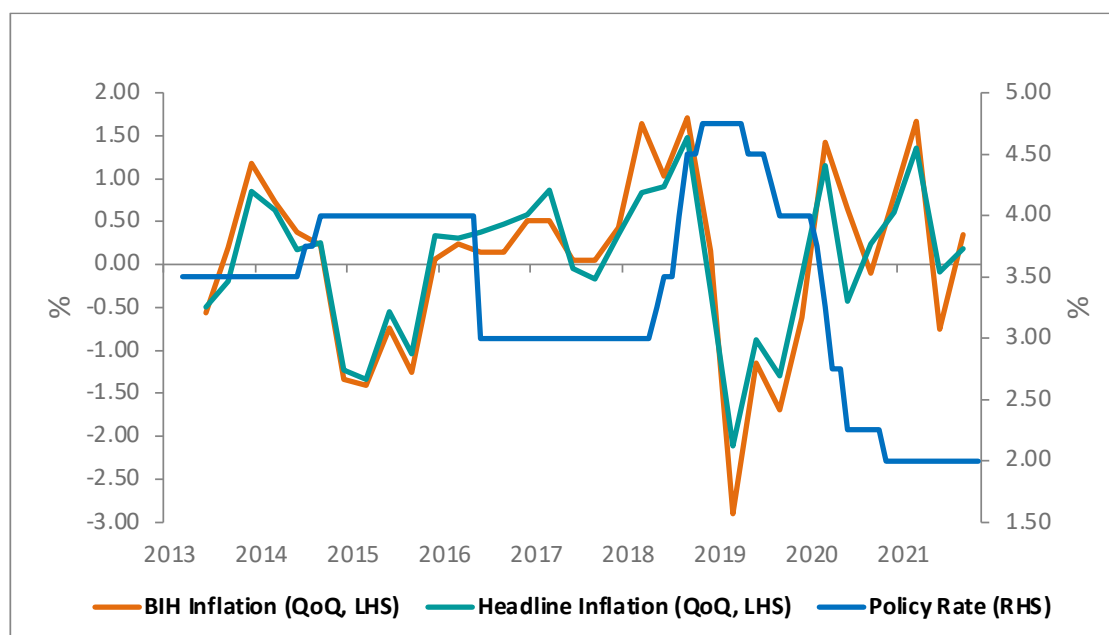
Figure 2. Monthly Headline and Bottom 30 percent Income Households (BIH) Inflation vis-à-vis Inflation Target



Sources: Philippine Statistics Authority, Bangko Sentral ng Pilipinas, CEIC

When the lockdown to contain the COVID-19 started during the first quarter of 2020, inflation began to rise due to supply-side shocks. BIH Inflation also increased higher than the Headline Inflation since food prices, which has the highest weight in their commodity basket, increased significantly due to supply chain disruptions. Moreover, with a low-interest environment in place to support economic recovery, various analysts are predicting that inflation would further increase due to the current monetary policy stance as what is currently happening in the United States of America and Europe.

Nevertheless, the BSP's conduct of monetary policy remains effective to manage inflation. It can be observed that both the Headline and BIH Inflation move together generally in the same direction with the changes in policy rate. Based on Figure 3, the change in the BSP's policy rate can be followed by some change in inflation after two to three quarters, on average. This is in line with the theoretically expected lagged impact of an interest rate increase over inflation. However, Headline Inflation tends to respond faster to policy rate changes when compared to the BIH Inflation. For example, when the BSP reduced its policy rate in 2016 to manage the decline in inflation, the change in Quarterly BIH Inflation was lower than the Headline and only became higher towards the second half of 2017.

Figure 3. BSP's Policy Rate vis-à-vis Change in Quarterly Inflation

Sources: Philippine Statistics Authority, Bangko Sentral ng Pilipinas, CEIC, author's calculation

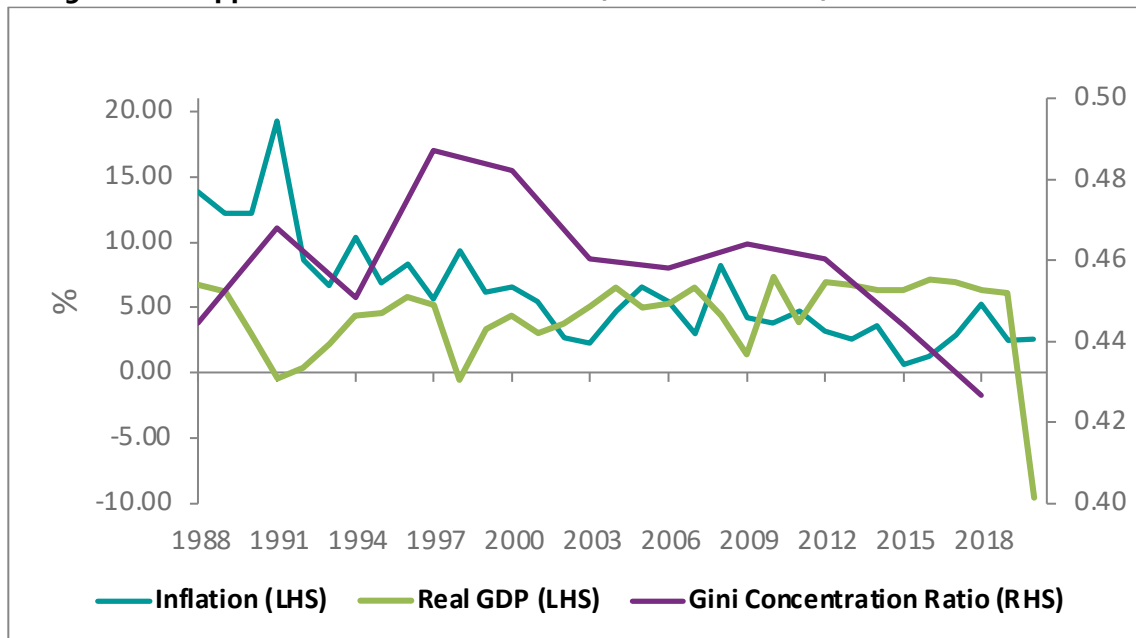
On a more general note, the standard measurement for quantifying economic inequality involves the distribution of income between population groups. The Gini Index or Ratio measures such distribution and has been the mainstay gauge for inequality, even in the Philippines. Every three years since 1985, the Philippines has been publishing its Gini Concentration Ratio. It went as high as 0.49 in 1997 and as low as 0.43 during its latest release in 2018 (Figure 4). The higher the ratio, the more concentrated the income is on certain groups of the population. Policy and structural changes are some of the factors which influence the Index. However, in general, the use of the Gini Index has been constrained by its limitations to capture real-time and disaggregated measures of inequality across different types of population.

Data shows that when the Gini Concentration Ratio is plotted together with annual inflation and year-on-year Real Gross Domestic Product (GDP), inequality increases during a continuous high inflation reading and coincides with documented economic crises (Figure 4). In the case of the Philippines, the recently recorded increase in the Gini Concentration Ratio by the PSA during 1997 (Asian Financial Crisis) and 2009 (Global Financial Crisis) were coupled by high rates of inflation from 1994, 1996, 1998 and 2005, 2006, and 2008, respectively.

Furthermore, when recent annual Headline and BIH Inflation numbers are used to compute households' real income, it highlights the disproportionate erosion of wages between the average and low-income households (Figure 5). Poor households – who normally depend on day-to-day earnings or fixed salaries – are most vulnerable to rising commodity prices, especially that their income is not regularly adjusted based on inflation.

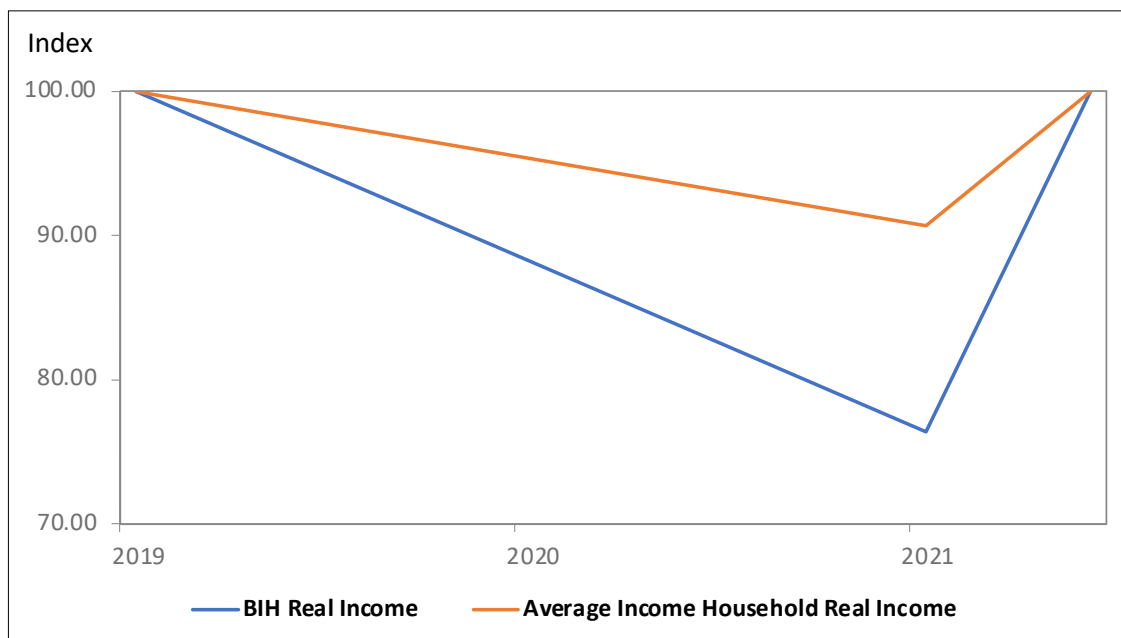
The Philippines' minimum daily wages across different regions have not been amended since 2019, except for Region VII (National Wages and Productivity Commission, 2021).

Figure 4. Philippine Gini Concentration Ratio, Annual Inflation, and Real GDP Growth



Sources: Philippine Statistics Authority, CEIC

Figure 5. Disproportionate Impact of Inflation on the Real Income of the Average and Bottom 30% Income Households¹



Sources: Department of Labor and Employment, Philippine Statistics Authority, author's calculation

¹ The simulation of real income is derived from the Headline and BIH annual inflation readings and indexed wages of households (based from the Department of Labor and Employment (DOLE) and PSA's Family Income and Expenditure Survey (FIES), the region with the lowest minimum daily wage (Bicol – Php 310) and national average daily wage (Php 366) were used as proxies to low-income and average income households, respectively).

3. Review of Literature

Inequality has long been present in the society. As early as 1912, measures of economic inequality have been used such as the Gini Index by Corrado Gini. In the 1980s, inequality continuously rose largely due to structural factors. However, the European Central Bank observed that this issue only began to receive more attention after the Global Financial Crisis (GFC) because of rising unemployment and varying levels of development between commodity prices, income, and wealth. This pushed various institutions to start examining the relationship of their actions to inequality.

The COVID-19 pandemic further puts inequality into the spotlight. Recent data from the Philippine Labor Force Survey shows that unemployment is more concentrated on the youth and the service sector. The Asian Development Bank (ADB) and Thinking Machines (2020) also note that the sudden shift to digitalization has left those with less access – especially people living in rural areas – to adapt and participate in a digitally-driven economy. Moreover, the Bank for International Settlements (2021) sees that further lowering of central bank's interest rates and extensive use of balance sheets to support economic activity have benefitted mostly the rich by boosting asset prices.

The disproportionate impact of employment of young people would degrade the potential benefits of utilizing the demographic dividend in the long term – this is crucial for the AmbisyonNatin 2040 since it anchors on the potential of a young Filipino population. The United Nations (2020) sees that less access to digital services would also impact the quality of education and ability of the people to spend using digital transactions. The injection of economic stimulus has been seen to cause a positive output gap which results in the spike in inflation that can disproportionately erode purchasing power, especially of lower-income households.

Economic downturns and inequality can affect each other, thereby, creating sluggish growth. The World Bank Gini Estimates database indicates that the Asian Financial Crisis (AFC) and the recent Global Financial Crisis (GFC) saw a rise in the Gini Index of various countries. Hill and Narayan (2021) note that evidence from past recessions, the same as the current economic decline caused by the COVID-19 pandemic, leads to a negative impact on job and income losses, thereby, increasing inequality. Additionally, the Bank for International Settlements (2021) notes that inequality intensifies the depth and duration of recessions. Aggregate demand falls since low-income workers, which have a higher tendency to consume, are typically first to be laid off during economic declines.

Authorities have been swift in providing policy measures to mitigate the impact of the current pandemic-induced crisis. Yet, despite deploying traditional and unconventional policies, the pandemic still provides a highly uncertain environment. The emergence of COVID-19 variants, the unequal pace of vaccination, slow economic recovery, and the potential endemic phase of the virus have raised various concerns about the sustainability and potential aftereffects of the extreme measures taken to fight the pandemic.

Domanski et al. (2016) highlight that monetary policy has been one of the policies in question whether it has contributed to rising inequality post-GFC. Moreover, Dolado et al. (2018) note that following the GFC, concerns have been raised on how macroeconomic policies that have a broad impact across the economy might affect inequality. These policies, monetary policy in particular, have different levels of interaction depending on which transmission channel they affect. Links of the effect of monetary policy on inequality have been studied in the United States by Coibion et al. (2012), Gornemann et al. (2016), and Amaral (2017).

However, studies about the relationship between monetary policy and inequality in emerging markets have been few. This led to different initiatives analyzing the channels of the distributional impact of monetary policy in various jurisdictions. In the Philippines, Cabote and Fernandez (2019) note that monetary policy operates primarily through the inflation channel and has more negative impact on the lower-income class. Albert et al. (2020) discussed that the lower-income class (poor, low income but not poor, and lower middle-income group) is vulnerable especially during the pandemic because of low savings and little protection against potential economic challenges; as of 2018, around seven out of 10 Filipinos belonged to the poor to lower middle-income groups. At the same time, they also stressed the importance of research to find innovations to increase the protection for the at-risk, especially during these times.

The impact of inflation on wages gives the most substantial effect of policy on the lower-income class. A small amount of increase in commodity prices translates to a bigger share of a relatively lesser dispensable income of this group than the upper-income class.

Central banks seek and aim achieve low and stable inflation. The BIS Annual Economic Report 2021 emphasizes that although inequality can be best addressed by structural policies, central banks can aid in the short term by achieving their inflation targets and sustaining stable rates. However, due to policy rate cuts by different monetary authorities to dampen the impact of the pandemic on the economy, inflation is predicted to rise beyond targets. This could have a significant effect on households especially since unemployment is relatively high, and supply chain concerns have been pushing prices higher.

Understanding the dynamics between inflation, monetary policy, and households can pave the way to shed light and understand inequality in the Philippines. Data from the PSA on Headline and BIH Inflation essentially represents the average and low-income households, respectively. However, based on the current body of literature in the Philippines, these two data sets have not yet been fully utilized to assess the impact of monetary policy on inequality. Nevertheless, integrating this type of data – that is mainly influenced by BSP's inflation-targeting mechanism – in the analysis of Cabote and Fernandez (2019) could result in further shedding light to grasp the potential role of central banks to affect inequality.

4. Methodology

This paper seeks to understand the relationship between monetary policy, inflation, and inequality in the Philippines and modifies the simple vector autoregression model (VAR) developed by Cabote and Fernandez (2019) to establish this relationship. The VAR model used is as follows:

$$x_t = \begin{pmatrix} d(RRP(-1))_t, d\log(DUBAIOIL(-1))_t, \\ d\log(GDPSA)_t, \\ d\log(CPI)_t, d\log(CPIBOTTOM)_t \end{pmatrix} \quad (1)$$

In this model, quarterly Headline (CPI_t) and the BIH Consumer Price Index ($CPIBOTTOM_t$) values are obtained from the Philippine Statistics Authority from 2012-2021. These two inflation variables are used in the model to understand unequal effects of monetary policy on different types of households unlike the VAR in Cabote and Fernandez (2019), which uses instead the Gini Index. Use of the more frequent CPI variables enables the model to give more real-time analysis than the three-year lag using the Gini Index. At the same time, using the CPI values generated from two different types of households can possibly show existing inequalities due to the influence of monetary policy through the inflation channel between these two separate groups.

Other macroeconomic variables included in the model (equation 1) are the seasonally adjusted quarterly gross domestic product ($GDPSA_t$), lagged quarterly average Dubai crude oil price per barrel in US Dollars ($DUBAIOIL_t$), and the lagged policy rate of the BSP (RRP_t). Post-estimation tests and other details about the VAR model are in Appendix 1. The notation $d(\cdot)$ denotes changes in variables.

A Bayesian regression was also used to increase the robustness of the model. No prior distribution was assumed in the model to fully rely on existing inflation and monetary policy values due to a small number of observations. The regression can be expressed as:

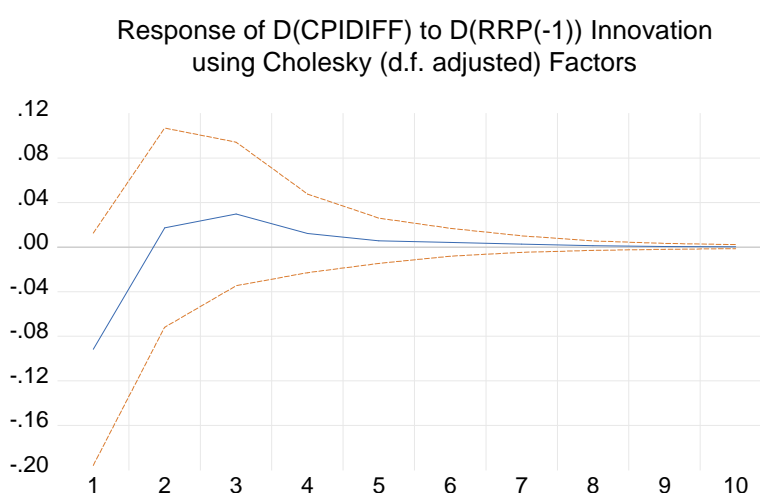
$$\rho(\theta|y, z) \propto \rho(y|\theta, z) \quad (2)$$

where y is the outcome variable which represents either the Headline or BIH CPIs and z is the set of predictor variables which includes the policy rate of the BSP and the other macroeconomic variables in the VAR model were used in this regression. Other details about the Bayesian regression model are in Appendix 2.

5. Results and Discussion

Before analyzing the possible inequalities in responses between households, the author initially reconfirmed if the use of household CPI values can be a substitute or relative indicator for inequality. Using equation 1, the difference between Headline CPI and BIH CPI (CPIDIFF) were used instead of individual CPI values (i.e. $CPI_t - CPI_{BOTTOMt}$). A negative difference means higher inequality since the CPI of the BIH CPI is higher than the Headline, making the lower segments of the population absorb more loss in income than the average Filipino household. Results show that the impulse response function of this VAR supports the related discussion in the BIS Annual Report 2021 that central banks affect inequality in the short term as shown by a negative response during the first period (Figure 6). It suggests that, for instance, when the central bank decides to shift from an accommodative to a tight monetary policy stance to stabilize the economy during this period of the COVID-19 pandemic, it would potentially result in a higher negative difference between the Headline and the BIH CPI values, thereby, increasing inequality in the short term.

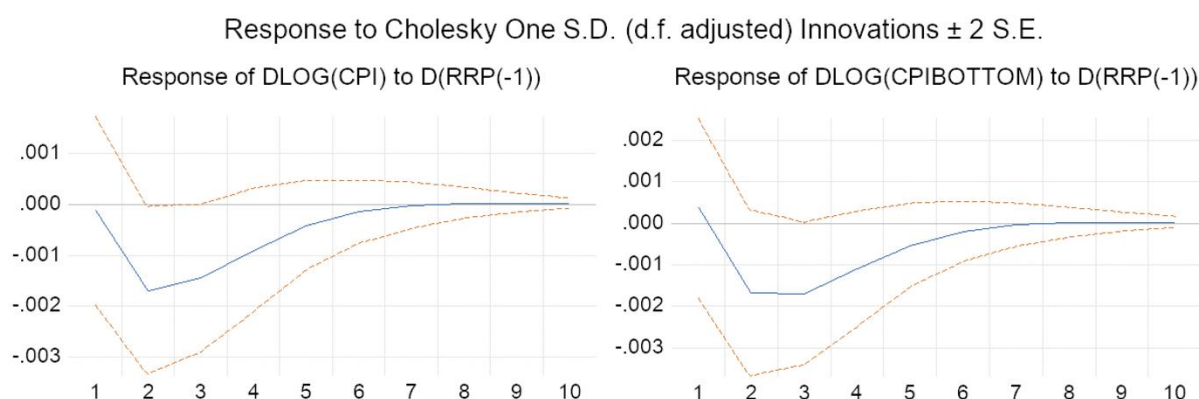
Figure 6. Response of Headline minus Bottom 30% Income Households (BIH) CPI to Positive Shocks on BSP's Policy Rate



Sources: BSP, PSA, CEIC, author's calculation

The impulse response functions of the two household CPI values with the various macroeconomic variables were obtained (Figure 7). The results suggest that a positive shock to a lagged policy rate can create a faster negative response to the Headline CPI (CPI) than the BIH (CPIBOTTOM). The former has a significant negative response starting in the 2nd period up until the 3rd period while the latter only elicit significant negative response in the 3rd period. This might indicate that despite BSP's monetary policy intervention to change the course of inflation in the next 2 to 3 quarters, lower-income households will most likely continue to experience further erosion of purchasing power than the average household due to their slower response to monetary policy rate changes.

Figure 7. Responses between Headline and Bottom 30% Income Households (BIH) CPI to Positive Shocks in BSP’s Policy Rate

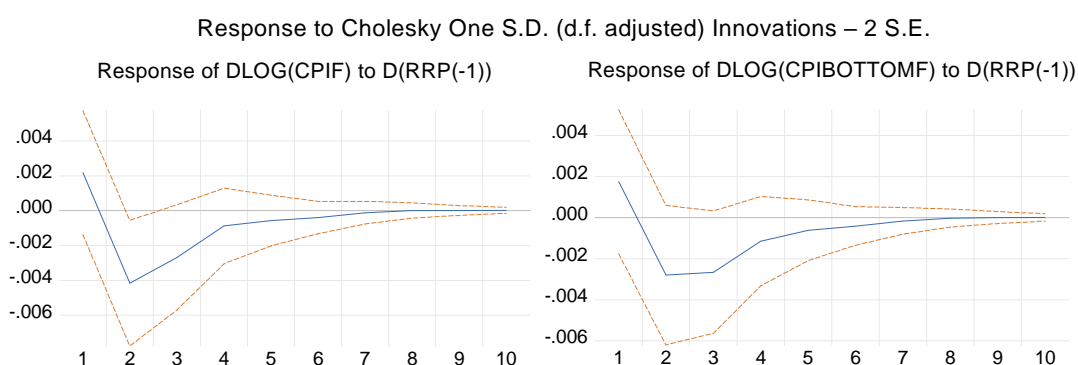


Sources: BSP, PSA, CEIC

To further understand which causes such inequality in responses, the model substituted the Headline and BIH with the CPI values of different commodity groups (i.e. Food, Housing, Electricity, Gas, and Other Fuels, Restaurant and Miscellaneous Goods and Services) which have the highest weights in the basket of goods of an average Filipino household.

The second set of impulse response functions of the VAR model indicates that among all commodity groups used, the responses of the Headline and BIH CPI on Food Products exhibit significant results (Figure 8). All other results indicate that Headline CPI on various commodities responds faster and larger to BSP’s policy rate given the steeper slope and higher magnitude of values on the y-axis than that of the BIH CPI, respectively (See Appendix 3). These results relatively indicate that the inequality of responses using the baseline model above is significantly driven by food, at the same time, by the unequal responses in housing, electricity, gas, and other fuels. These commodity groups are important given that they can have large share in the basket of goods especially of low-income households in the Philippines.

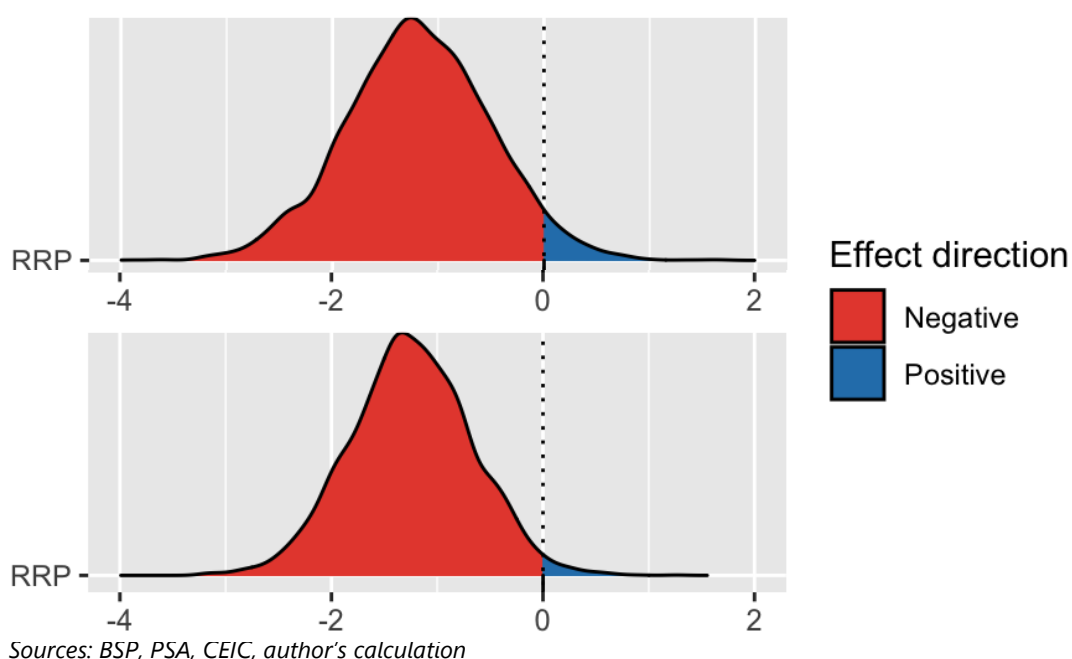
Figure 8. Responses of CPI on Food Products between households to Positive Shocks in BSP’s Policy Rate



Sources: BSP, PSA, CEIC

The Bayesian Regression also reflects the same results demonstrating the robustness of the results of the baseline VAR model. The p-directions, which indicate the possible effect of the predictor variable to the outcome variable, show that the posterior distribution using Headline CPI leans more to the negative side of the normal curve than the BIH CPI (Figure 9). This suggests that BSP's policy rate or RRP is more likely to elicit a greater mitigating effect towards the Headline Inflation than the BIH Inflation (See R software's *stan_glm* results in Appendix 2 for the exact median values).

Figure 9. Posterior distribution of Headline (top) and Bottom 30% Income Households (bottom) CPI using BSP's Policy Rate as the predictor variable



Based on these regressions, it can be observed that the impact of monetary policy via the inflation channel generates an unequal effect towards the average relative to the low-income households. Amaral (2017) noted that the inflation tax channel primarily causes the erosion of the purchasing power of low-income households as they rely more on day-to-day earnings to make purchases. Other studies also appear to reconfirm the above-mentioned results that monetary policy might influence inequality. Coibion et al. (2012) observe that monetary policy shocks generate income, earnings, expenditure, and consumption inequality among different percentile distributions. Correspondingly, Gornemann et al. (2016) highlight that the heterogeneity of households changes the transmission of monetary policy, thereby, contributing to inequality.

The larger response of Headline Inflation to policy rate changes than that of the BIH Inflation extends the argument of Cabote and Fernandez (2019) that inflation disproportionately affects different income households since it significantly erodes the purchasing power of lower-income families. And the BSP's monetary policy operation through the inflation channel can influence such impact among households.

Several factors might come into play when analyzing such inequality in responses in the Philippines. First, based on Engel's law, low-income households have a higher share in expenditure on food than households with higher income levels. Since most of their family income is allocated on food, and prices of these kinds of products are relatively higher than non-food items and generally more volatile, these make poorer households more sensitive to inflation and economic shocks (See Figures 1 and 5).

Second, structural issues such as subsidies implemented by the National Government can also become one of these factors. Rice is one of the main drivers of inflation (Department of Finance and PSA, 2018). The National Food Authority (NFA) is one of the main agencies mandated to stabilize the price of rice by controlling rice imports and providing rice subsidies. Despite the attempts of the NFA to regulate rice, it has faced numerous supply chain issues which eventually led to the severe rice shortage in 2018 that drove inflation by a factor of 10 (Ocampo and Pobre, 2021). This led to the enactment of the Rice Tariffication Law (RTL) which removed the restrictions on rice imports and replaced it with a 35 percent import tariff. The law contributed to the stabilization of rice prices since 2019. However, one major concern of the RTL is the slow implementation of the Rice Competitiveness Enhancement Program (RCEP) which instructs the National Government to allocate PHP 10 billion annually from the collected import tariff to help domestic rice farmers compete with cheaper imported rice by providing aid to mechanization, seed distribution, credit assistance, and technical education and skills development (Action for Economic Reform, 2021). While the price of rice generally dropped and has been stable for the past two years, monitoring the full implementation of the RTL, especially of the RCEP, remains in its infancy. While the benefits from the RTL have included the stability of the price of rice – and in turn inflation, the structural safety nets and support provided by the RTL are steps that reduce the distributional or sectoral effects of some stabilization policies.

Third, monetary policy mainly triggers price changes for future goods and consumption. The subdued response of the BIH Inflation can also be attributed to the characteristics of a lower-income household. A study by Spector and CityLab (2016) shows that in the United States, low-income earners pay considerably more of their income for electricity due to their inability to buy or upgrade to more energy-efficient appliances or household improvements. This case might also be applicable in the Philippines where low-income households are less likely to spend on household maintenance, durable furniture and equipment, and other miscellaneous goods and services. This is reflected in the relatively low expenditure of the BIH on Miscellaneous Goods and Services, and Equipment in Table 1 and the set of impulse response functions of the VAR model in Appendix 3. The continued use of outdated household equipment by low-income households hinders them from reacting faster to policy rate changes that are based on the current economic environment.

Lastly, low-income households are least likely to have inflation hedges. Unlike higher income groups who often diversify their investments to protect them against erosion of

purchasing power due to rising prices, low-income households have limited capability to buy these types of assets. Family income is mostly allocated to food, housing, electricity, and basic services, thereby, spending less on other assets which would shield them from inflation. Since poor families tend to hold most of their financial assets in the form of cash or non-interest-bearing assets, they are more sensitive to macroeconomic changes or instabilities rather than changes in monetary policy stance.

6. Conclusion

The objective of the study is to understand the potential relationship between monetary policy and inequality by analyzing the responses of Headline and Bottom 30 percent Income Households (BIH) to Policy Rate in the Philippines. The empirical exercise modifies the simple Vector Autoregression (VAR) developed by Cabote and Fernandez (2019) in measuring the distributional impact of BSP's monetary policy.

Based on the VAR model, a contractionary monetary policy is seen to affect inequality because an average household would likely experience lower inflation than that of a low-income household. It was further identified that food is one of the main commodity groups that is characterized of such unequal response.

Following the VAR analysis, the paper also used a Bayesian regression to characterize the impact of BSP's monetary policy on the Headline and BIH. The posterior distribution of the Headline CPI yields more concentration on the negative side of the normal curve than the BIH CPI.

The results of these regressions suggest that monetary policy is likely to cause more impact on the Headline Inflation than the BIH Inflation. This is due to the different structural and policy factors that affect different types of households. This finding could have significant policy implications for monetary authorities, especially during this COVID-19 pandemic.

To aid in addressing the issue of inequality in the Philippines, authorities and stakeholders may also look into the implication of policies at a more disaggregated level by observing its impact on different income households particularly to the low-income groups. The latter segment of the population is the one who has been hurt most since the start of the COVID-19 pandemic due to possible loss of jobs, less ability to participate in a digital economy, and further erosion of income and savings caused by rising prices and additional spending on healthcare goods and services. Thus, by ensuring equitable policies, including "non-monetary" interventions, for all types of households on top of maintaining low and stable inflation, the BSP can attain its goal of being closer to the people and providing a better quality of life for all Filipinos during these trying times.

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Appendix 1. Vector Autoregression Model Results using EViews

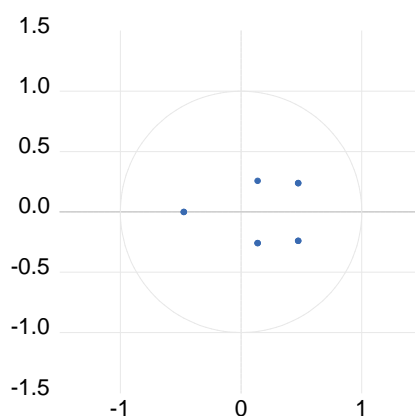
Statistical results of VAR model

Vector Autoregression Estimates
 Date: 12/03/21 Time: 09:47
 Sample (adjusted): 2012Q4 2021Q2
 Included observations: 35 after adjustments
 Standard errors in () & t-statistics in []

	D(RRP(-1))	DLOG(DUBA)	DLOG(GDPS)	DLOG(CPI)	DLOG(CPIB)
D(RRP(-2))	0.669843269 0.139421632 [4.80444]	-0.024886754 0.064816545 [-0.38396]	0.001003315 0.019488447 [0.05148]	-0.006162250 0.003243544 [-1.89985]	-0.005819011 0.003830900 [-1.51897]
DLOG(DUBAIOIL(-2))	-0.160674486 0.276463849 [-0.58118]	-0.215113671 0.128526911 [-1.67369]	-0.047158670 0.038644299 [-1.22033]	0.008183704 0.006431734 [1.27239]	0.008057770 0.007596422 [1.06073]
DLOG(GDPSA(-1))	1.969013645 1.620093200 [1.21537]	1.147432377 0.753174691 [1.52346]	0.209800195 0.226457698 [0.92644]	0.001770784 0.037690314 [0.04698]	-0.000843655 0.044515449 [-0.01895]
DLOG(CPI(-1))	25.50320641 27.06114740 [0.94243]	50.74018034 12.58061655 [4.03320]	-4.235214141 3.782625068 [-1.11965]	0.520725839 0.629558318 [0.82713]	0.819618895 0.743561623 [1.10229]
DLOG(CPIBOTTOM(-1))	-4.591510854 21.48984288 [-0.21366]	-29.28068171 9.990539912 [-2.93084]	4.061081200 3.003864440 [1.35195]	-0.318930874 0.499945887 [-0.63793]	-0.441940077 0.590478379 [-0.74844]
C	-0.190495315 0.071427844 [-2.66696]	-0.167290386 0.033206512 [-5.03788]	0.005987785 0.009984231 [0.59972]	0.005463054 0.001661717 [3.28759]	0.005154333 0.001962629 [2.62624]
R-squared	0.533427877	0.675470673	0.114778741	0.260423334	0.272941091
Adj. R-squared	0.452984408	0.619517341	-0.037845613	0.132910116	0.147586107
Sum sq. resids	1.592640236	0.344214468	0.031118013	0.000861980	0.001202428
S.E. equation	0.234347239	0.108947071	0.032757212	0.005451921	0.006439180
F-statistic	6.631089909	12.07203659	0.752034244	2.042324227	2.177345346
Log likelihood	4.411362027	31.21932373	73.28018978	136.0406153	130.2154550
Akaike AIC	0.090779312	-1.441104213	-3.844582273	-7.430892308	-7.098026003
Schwarz SC	0.357410408	-1.174473117	-3.577951176	-7.164261212	-6.831394907
Mean dependent	-0.057142857	-0.016628320	0.011730394	0.006807159	0.007605692
S.D. dependent	0.316854580	0.176623354	0.032154410	0.005854873	0.006974375
Determinant resid covariance (dof adj.)	6.748785334234378e-17				
Determinant resid covariance	2.635575016305038e-17				
Log likelihood	419.745547692785				
Akaike information criterion	-22.27117415387343				
Schwarz criterion	-20.93801867259679				
Number of coefficients	30				

Inverse Roots Test showing no root lies outside the unit circle;
 VAR satisfies the stability condition

Inverse Roots of AR Characteristic Polynomial



VAR Lag Order Selection Criteria showing the basis for the use of

1st order lag in Equation 1

VAR Lag Order Selection Criteria
 Endogenous variables: D(RRP(-1)) DLOG(DUBAIOIL(-1)) DLOG(GDPSPA) DLOG(C
 Exogenous variables: C
 Date: 12/03/21 Time: 09:48
 Sample: 2012Q1 2021Q3
 Included observations: 33

Lag	LogL	LR	FPE	AIC	SC	HQ
0	353.79627	NA	4.54e-16	-21.13917	-20.91242*	-21.06288
1	395.92555	68.93882*	1.64e-16*	-22.17731*	-20.81684	-21.71955*
2	408.60768	16.90951	3.87e-16	-21.43077	-18.93659	-20.59155
3	429.87577	21.91258	6.63e-16	-21.20459	-17.57670	-19.98392

* indicates lag order selected by the criterion
 LR: sequential modified LR test statistic (each test at 5% level)
 FPE: Final prediction error
 AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

VAR Residual Serial Correlation LM Test indicating no autocorrelation was detected with the VAR model

VAR Residual Serial Correlation LM Tests

Date: 12/03/21 Time: 09:50
 Sample: 2012Q1 2021Q3
 Included observations: 35

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	15.464755	25	0.92983	0.5876135	(25, 75.8)	0.93199
2	22.366405	25	0.61450	0.8853839	(25, 75.8)	0.62259

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	15.464755	25	0.92983	0.5876135	(25, 75.8)	0.93199
2	43.191964	50	0.74115	0.8180041	(50, 71.8)	0.77252

*Edgeworth expansion corrected likelihood ratio statistic.

Granger Causality Test indicating RRP renders granger causality to Headline and Bottom
30 percent Income Households CPI

VAR Granger Causality/Block Exogeneity Wald Tests

Date: 12/03/21 Time: 09:50

Sample: 2012Q1 2021Q3

Included observations: 35

Dependent variable: D(RRP(-1))

Excluded	Chi-sq	df	Prob.
DLOG(DUBAIOIL(-1))	0.337766938	1	0.561121032
DLOG(GDPSA)	1.477125696	1	0.224224775
DLOG(CPI)	0.888172164	1	0.345973115
DLOG(CPIBOTTOM)	0.045650417	1	0.830812532
All	11.76049846	4	0.019224027

Dependent variable: DLOG(DUBAIOIL(-1))

Excluded	Chi-sq	df	Prob.
D(RRP(-1))	0.147422837	1	0.701010453
DLOG(GDPSA)	2.320933858	1	0.127643374
DLOG(CPI)	16.26672638	1	5.502171067
DLOG(CPIBOTTOM)	8.589827632	1	0.003380460
All	60.35749711	4	2.440027435

Dependent variable: DLOG(GDPSA)

Excluded	Chi-sq	df	Prob.
D(RRP(-1))	0.002650455	1	0.958940987
DLOG(DUBAIOIL(-1))	1.489197264	1	0.222341050
DLOG(CPI)	1.253614928	1	0.262863166
DLOG(CPIBOTTOM)	1.827774806	1	0.176390600
All	3.678152544	4	0.451311482

Dependent variable: DLOG(CPI)

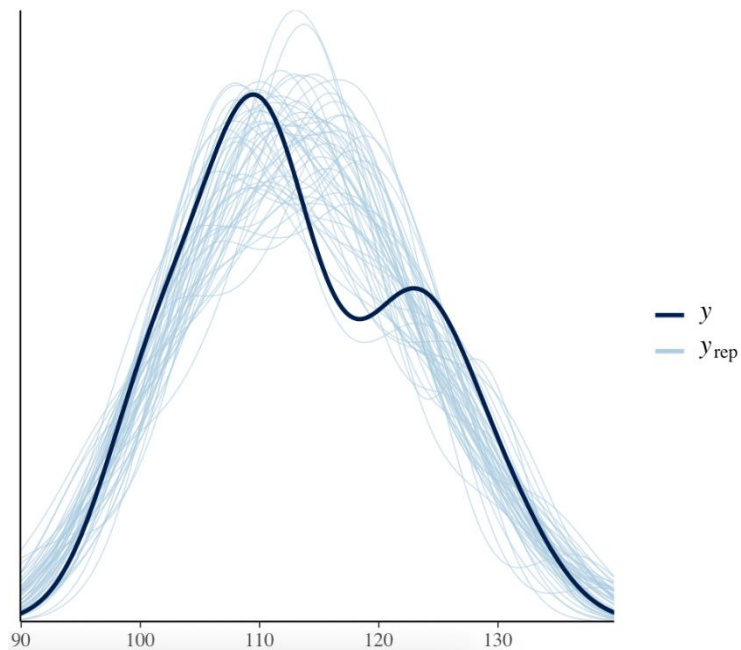
Excluded	Chi-sq	df	Prob.
D(RRP(-1))	3.609431962	1	0.057452740
DLOG(DUBAIOIL(-1))	1.618987967	1	0.203232958
DLOG(GDPSA)	0.002207352	1	0.962527195
DLOG(CPIBOTTOM)	0.406955692	1	0.523518733
All	6.383008386	4	0.172312683

Dependent variable: DLOG(CPIBOTTOM)

Excluded	Chi-sq	df	Prob.
D(RRP(-1))	2.307260168	1	0.128770850
DLOG(DUBAIOIL(-1))	1.125152854	1	0.288811610
DLOG(GDPSA)	0.000359177	1	0.984879412
DLOG(CPI)	1.215038363	1	0.270336577
All	7.600210533	4	0.107370756

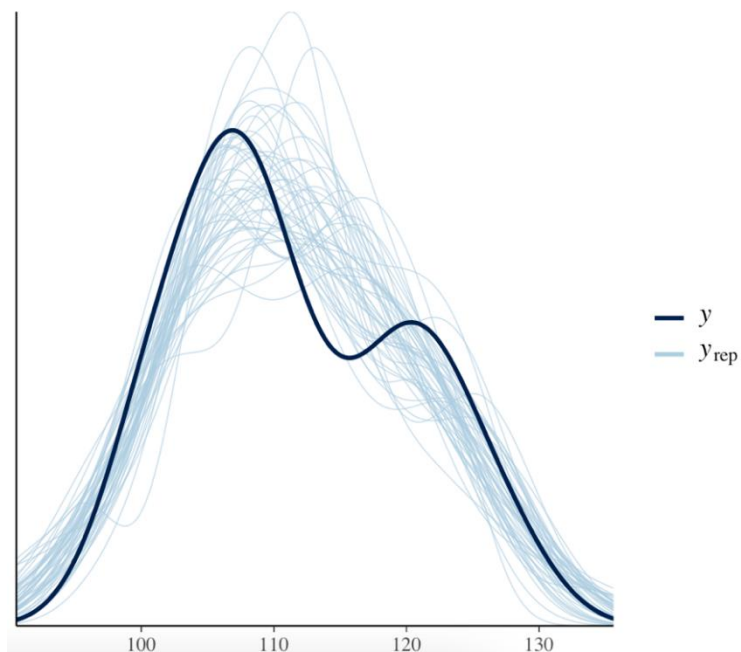
Appendix 2. Bayesian Regression Results using R

Overlay Density Plot of Bayesian Regression showing the fit of the model to the observed outcome variable y using the Bottom 30 percent Income Household Inflation



Sources: BSP, PSA, CEIC

Overlay Density Plot of Bayesian Regression showing the fit of the model to the observed outcome variable y using the Headline Inflation



Sources: BSP, PSA, CEIC

stan_glm function in R showing higher negative median of the posterior distribution of Headline CPI (left) than Bottom 30 percent Income Households CPI (right)

```
stan_glm
family:      gaussian [identity]
formula:     cpi ~ RRP + gdpsa + dubaioil
observations: 38
predictors:  4
-----
              Median MAD_SD
(Intercept) 51.201  5.708
RRP          -1.256  0.564
gdpsa         0.001  0.000
dubaioil      0.003  0.019

Auxiliary parameter(s):
      Median MAD_SD
sigma 2.386  0.286

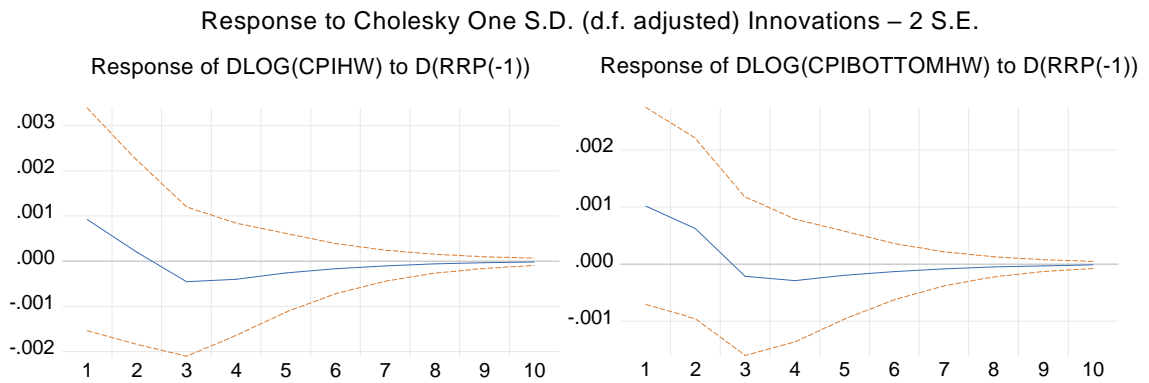
stan_glm
family:      gaussian [identity]
formula:     cpibottom ~ RRP + gdpsa + dubaioil
observations: 38
predictors:  4
-----
              Median MAD_SD
(Intercept) 48.925  6.343
RRP          -1.198  0.666
gdpsa         0.001  0.000
dubaioil     -0.015  0.022

Auxiliary parameter(s):
      Median MAD_SD
sigma 2.691  0.336
```

Sources: BSP, PSA, CEIC

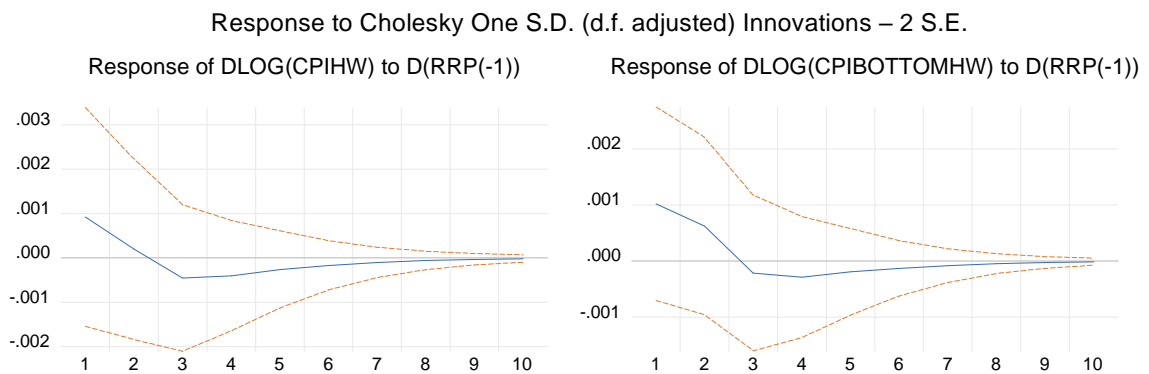
Appendix 3. Responses of Selected CPI Commodities to Positive Shocks in BSP’s Policy Rate

Responses of CPI on Housing, Water, Electricity, Gas, and Other Fuels between households to Positive Shocks in BSP’s Policy Rate



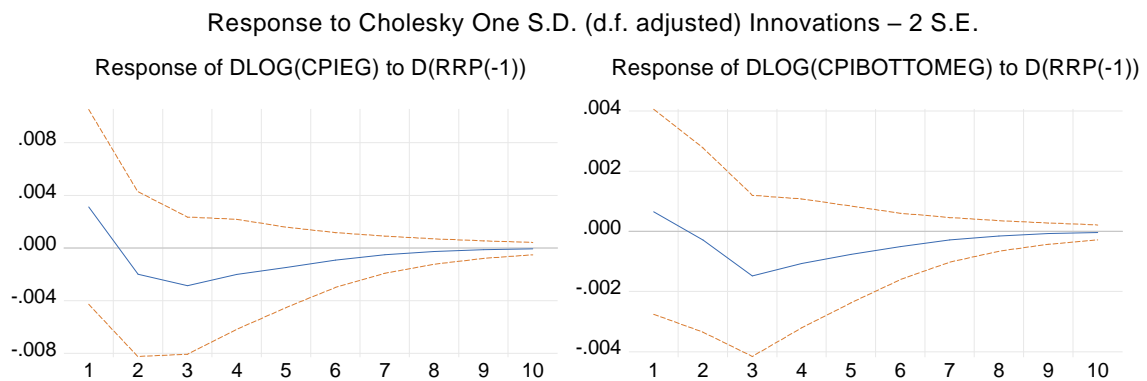
Sources: BSP, PSA, CEIC

Responses of CPI on Actual Rentals for Housing between households to Positive Shocks in BSP’s Policy Rate

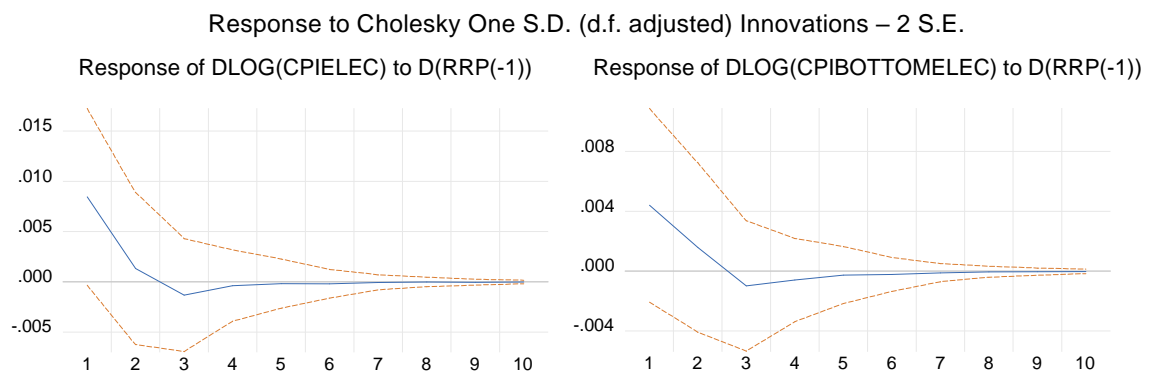


Sources: BSP, PSA, CEIC

Responses of CPI on Electricity, Gas, and Other Fuels between households to Positive Shocks in BSP’s Policy Rate



Responses of CPI on Electricity between households to Positive Shocks in BSP’s Policy Rate



Responses of CPI on Restaurants and Miscellaneous Goods and Services between households to Positive Shocks in BSP’s Policy Rate

