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# Central Bank Independence And Inflation – Output Variability Tradeoff

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**Abstract**

*Global evidences show major swing towards autonomy of central banks, Theory and practice show that autonomous central banks are sufficient to maintain low and stable inflation, not due to political inclinations. Our results suggest that the level of independent and discretionary monetary policy is low, Pakistan's central bank is not proficient enough to sustain low and stable inflation. In this paper, the central bank independence index is updated up to the year 2021; the monetary authority's preference parameter is calculated to find gain or loss to the economy caused by the value of central bank independence through inflation-output variability trade-off. In doing so, correlation, OLS Regression, and ADF Unit Root Tests are used to check statistical significance.*

**Keywords:** *Central Bank Independence, Inflation-Output Variability Tradeoff, Monetary Policy Preference Parameter, Discretionary Monetary Policy, Price Stability.*
***JEL: E58, P24, E52, E31***

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## INTRODUCTION

The Literature on autonomous central banks is on the question of a negative connection between independent central bank and the inflation rate.A central bank free from political pressure would yield low and stable inflation and that a sovereign central bank is capable to defeattime inconsistency dilemma of monetary policy. Negative association is found in both developed and developing countries between inflation and independent central bank, as they keep commitment to price stability by maintaining low and stable inflation. Because markets believes and wants assurances this Public Institution is free from political pressures (Abdul Hadi et al., 2019 b; Hernawati et al., 2021) This is evident from the fact that countries having independent central banks have relatively lower inflation compared to those having lower or no independence.

Pakistan being a developing country is confronted with various economic and political challenges at the same time (Ghani et al., 2023; Khan et al., 2022). The political uncertainty and challenges hampered the structures of the institutions ultimately giving rise to the challenges of inconsistent growth, rising unemployment, price stability, exchange rate management, and fluctuations, twin deficits, financial stability, and especially overall macroeconomic management. These objectives can only be achieved with joint collaboration at all levels of the government especially the Ministry of Finance and the Central Bank. The State Bank of Pakistan enjoys operation autonomy in selecting the suitable tools to reach assigned objectives, in the domain of inflation, interest, and exchange rates, and financial sector soundness. The inflation and GDP growth rate targets set by the Federal Government remained inconsistent over time (Abdul Hadi et al., 2019). In doing so the Government deviated from the real targets in pursuit of higher-than-potential growth, and is a The M2 money growth rate targets are set by the State Bank and has been surpassed regularly. The M2 money growth and actual rates of inflation remained over targets and 3% international level.This suggested the manner of monetary policy in an imperfect and on ad hoc basis, (Hayat, 2014).

The objective of this paper is to update the central bank independent index of Pakistan initially developed by Cukierman, Webb, and Neyapati 1992 (CWN). This index is tested with the inflation-output variability trade-off to investigate preference parameter of monetary authority and economic performance. We estimate a low level of central bank independence, no tradeoff, inverse relation between inflation-output variability, negative correlation between a term of governor in office and average inflation, and more weight assigned to output stabilization rather than inflation stabilization. The insignificant results are because of the low level of central bank autonomy, discretionary monetary policy, the tenor of the governor, and more than one objectives of the State Bank of Pakistan. Furthermore, it is also due to the excessive role of the Finance Ministry in achieving the desired national economic objectives.

Section I presents a literature on an independent central bank and inflation output-variability trade-off. In Section II, we develop models of economic performance under inflation-output variability tradeoff i.e. monetary authority's preference

parameter. Section III; develop models related to independent central bank and inflation-output variability tradeoff, along with the discussion of the results. In Section IV, we conclude our paper.

## LITERATURE REVIEW

The idea of independent central bank has been studied at length by economists and policymakers for the last five decades. These studies were a result of the sky rocketing inflationary periods of the 70s and 80s, this led to dramatic changes in monetary policy framework in several countries. The focus is on the question of whether there exists a negative relationship between autonomous central bank and the rate of inflation. It is widely accepted that a central bank free from political pressure would yield low and stable inflation. Bade and Parking (1985) were the first to conduct a study on this link.

Landstrom (2014) finds no trade-off between inflation and output volatility, after controlling for the level of independent central banks. However, there is a significant positive relationship regardless of the level of independent central banks. This suggests that independent central banks stabilize inflation by shifting the Taylor curve, substantially reducing inflation-output volatility (Rehman et al., 2015; Kashif et al., 2018).

Arestis and Mouratidis, (2004) studied performance of monetary policy on the basis of gaps in inflation-output variability tradeoff ratio of the European Monetary System. They examined whether the inflation targeting regime implemented in 1992 by European Monetary System, that changed the gaps in inflation-output variability tradeoff ratio. Evidences proved improvement in the tradeoff ratio in the many and deterioration some cases. Their findings recommended point of presence of asymmetries and different economic structures. Dittmar and Gavin, (1999) extended the in New Keynesian Phillips Curve and target price level. They examined tradeoff indirectly by most favorable inflation and rules of price level. Hence the tradeoff between inflation and output variability under price level targeting is more favorable than under an inflation targeting regime.

The short run variability of inflation is conditional upon the amount of persistence in the output gap and for a given level of output variability, and on the preference of central bank targets either inflation or price level, Svenson (1997). The enough persistence of the output gap will give central bank the preference price level target. To monitor inflation, the central bank should give weight to growth in nominal wages to achieve maximum economic stability, because wages are more cyclically sensitive to other prices in the economy, as they are subject to large idiosyncratic shocks, Mankiw and Reis's (2002).

## METHODOLOGY & DATA

According to equation.1 explain that Taylor (2013) believed that in addition to monetary policy inconsistencies, other non-fundamental events would also cause the actual unemployment rate to deviate from the natural rate.

$$it = \pi\_t + \phi\ (\pi t - \bar{\pi}) + \gamma y\_t + R \qquad \text{(Eq. 1)}$$

Presenting, Taylor (2013) thinks about that result (y_t) and expansion hole ($\pi$_t - $\bar{\pi}$) enter the national bank's reaction capability with an equivalent load of 0.50, and the harmony level of genuine financing cost (R) and expansion target ($\bar{\pi}$) is equivalent to 2%, so the accompanying condition. Condition. 2 make sense of i_t is the objective level of the transient ostensible loan cost and $\pi$_t is the expansion rate? $\bar{\pi}$ is the expansion target level, y_t is the result hole, the rate deviation of genuine Gross domestic product from its gauge of its expected level, and R is the balance level of the genuine loan fee.

$$it = 1.0 + 1.50 + 0.50y \qquad \text{(Eq. 2)}$$

The Taylor rule deviation is the outright worth of the distinction between the genuine financing cost and the rate target suggested by the Taylor rule and the above coefficients. In this way, there will be more modest deviations in the period of rules-based financial strategy and bigger deviations in the time of optional money related arrangement (Svenson, Solheim, and Steigum, 2002;Taylor, 2013; Parkin, 2013).

Subsequently Equation.3 make sense of that compromise among expansion and result (or joblessness), which is transient, the compromise between these two factors (expansion and result) is long haul for estimating monetary execution more than a few years (Taylor, 2013). To quantify monetary execution under the expansion yield unpredictability tradeoff, numerous free national banks utilize the accompanying quadratic misfortune capability to limit the weighted amount of expansion and result instability:

$$\text{Loss} = \lambda \text{Var}(\pi) + (1-\lambda)\ \text{Var}(y),\ 0 \leq \lambda \leq 1 \qquad \text{(Eq.3)}$$

Equation. 4 explain $\pi$ is inflation, y denote the output, Varrepresent thevariance, and $\lambda$ is the preference parameter of monetary authority. To estimate performance of the economy, variance of both the variables are combined for single performance measure as follows:

$$P = = \lambda \text{Var}(\pi) + (1-\lambda)\ \text{Var}(y) \quad \text{(Eq.4)}$$

Equation 5 show that P explain the performance, economy will be stable as lower the value of P.

$$E = \lambda\ [\ \text{Var}(\pi) - \text{Var}(\pi)^*] + (1-\lambda)\ [\ \text{Var}(y) - \text{Var}(y)^*] \quad \text{(Eq.5)}$$

Whereasvariation of output explained by Var(y), volatility of inflation described by Var($\pi$)*. The desired output is Var(y), and the intended inflation rate is Var($\pi$). The more closely that the E approaches zero, the more effective the monetary policy is. If is equal to 0, the central bank will prefer inflation stabilization, which aims to

keep actual inflation at the target level while allowing production to fluctuate. On the other hand, if = 1, the central bank will allow inflation to fluctuate while favoring output stabilization, where real output will be equal to the goal level of output. (2014) Landstrom. This is referred to as the policymaker's inflation variability aversion by Cecchetti and Ehrmann (2001). Almost 24 nations investigated by Cecchetti, Lagunes, and Krause (2006) and Cecchetti and Ehrmann (2002) received a value of 0.80 for the indicator (λ) with the exception of Greece, Israel, Mexico and Chile. These three nations received a value of (λ) 0.30 because they had high levels of inflation during the study period. The consequence is that, compared to production fluctuation, inflation variability has had a far smaller weight in policymakers' loss functions.

This is evidenced by Pakistan's monetary policy framework, which has an inflation target as an intermediate objective and currency stability, financial system soundness, and improved productive resource utilization as aspirational objectives. Meanwhile there is an oppositeassociation between inflation and output variability, study predict that higher variability will have lower weight in the policymaker's preferences, on the other hands lower variability will have moderate weight in computing (λ) for Pakistan.
π represent the Annual consumer price index percentage
Y represent the annual GDP growth rate (y) data from 1961 to 2019 were taken from the State
L explain the Bank of Pakistan's annual report to calculate the central bank's standard loss function
P describe the economic performance
E denote the policy efficiency

## DISCUSSION

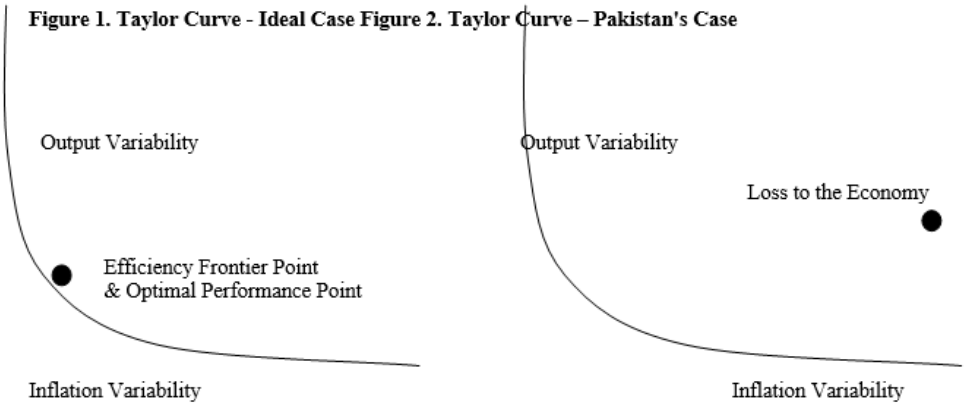
Results of equations 3,4&5;
Var(π) = 42.515 Var(y) = 5.513
λ(π) = 0.114λ(y)= 0.885
Economic Loss (P) = 9.761

The after effects of Conditions 3, 4 and 5 show that the financial misfortune (P) for example 9.761 is a lot bigger than 1, for example $0 \leq \lambda \leq 1$, for example the high unpredictability of expansion comparative with the variance of result because of the unpredictability of favored yield and the precariousness of the Pakistani economy. Policymakers have reliably preferred balancing out yield, putting more weight on yield unpredictability than expansion instability. Figures 1 and 2 show the ideal instance of the Taylor bend and the Pakistani economy not on the Taylor bend from 1961 to 2021. This implies that Pakistan's money related strategy isn't ideal, and the exhibition misfortune esteem is a high point "P" away from the Taylor bend and the beginning. This outcome is approved by the way that value steadiness isn't the main goal of the National Bank of Pakistan. It is a transitional objective towards the last objective.

A definitive objective is better use of useful assets and a sound monetary framework. Better usage of useful assets reflects development and work creation-situated strategies in a setting of cost unsteadiness. State Bank of Pakistan, (2015). One of the significant parts of reasonable freedom is "lawful autonomy". This is significant for two key reasons: first, it shows the level of freedom, i.e., the regulation pertinent to national bank autonomy, and second, all current endeavors to portray autonomy efficiently and basically depend on legitimate freedom (Bade and Stopping, 1980; Parkin, 1987). The regulations and resolutions of every national bank vary in their targets, extension and level of autonomy.

The Central Bank of Pakistan's 1992 Cookman Index score was also 0.21. The conclusion is that from 1959 to 2000, the Central Bank of Pakistan's independence index remained at 0.21. (Cukierman, 1992; Polillo and Guillen, 2005). Moreover, we update the Central Bank of Pakistan's legal independence index by extending Cukierman, Webb, & Neyapti's (1992) index. Based on the 40-year period from 1950 to 1989, the independence value of the Central Bank of Pakistan.

**Figure 1. Taylor Curve - Ideal Case Figure 2. Taylor Curve – Pakistan's Case**




## IV. INFLATION-OUTPUT VARIABILITY TRADEOFF AND CENTRAL BANK INDEPENDENCE

Condition 6 show that second model to appraise includes the reverse connection among expansion and result instability make sense of as follows.

$$Var(\pi_{(i)}) = \alpha_{o} + \alpha_{1} Var(y_i) + \varepsilon_{(i)} \quad \text{(Eq.6)}$$

Condition 6 depict that Var ( π_(i )) is the difference of expansion and Var (y_i) is the change of Gross domestic product. To test the vigor of the outcomes, the Ow-Yong (1996) vector model of control factors was utilized as follows:

$$Var(\pi_{(i)}) = \alpha_{o} + \alpha_{1} Var(y_i) + \alpha_{(2)} [CBI]_{(i)} + \gamma_j [X_i + \varepsilon]_i \quad \text{(Eq.7)}$$

In the situation 7 , recipe make sense of that CBI is the national bank's freedom file, X_ii is the vector of other control factors, and α_₀, α_(1,) α_(2,) are to be assessed. National bank freedom is connected with inclinations among expansion and result unpredictability (λ), which has been assessed beforehand in Conditions 6 and 7. (Landstrom, 2014) show that national bank freedom decides area decision on the Taylor bend, it very well may be assessed by relapsing expansion and result change on the CBI.

$$Var\ (\pi_i) = \gamma_0 + \gamma_1 CBI_i + \gamma_2 X_i + \varepsilon_i \qquad \text{(Eq.8)}$$

$$Var\ (y_i) = \delta_0 + \delta_1 CBI_i + \delta_2 X_i + \varepsilon_i \qquad \text{(Eq.9)}$$

Eq 8 and eq. 9 show that more elevated level of national bank freedom profit lower fluctuation in expansion and higher changeability of result. Eq 8 and eq. 9 show that more elevated level of national bank freedom profit lower fluctuation in expansion and higher changeability of result.

$$Var\ (\pi_i) = \alpha_0 + \alpha_1 Var\ (y_i) + \alpha_2\, CBI_i + \gamma_j \qquad \text{(Eq.10)}$$

Where
Var ( π_(i )) is the variability of inflation and is a dependent variable.
Var (y_i) is output variability and is an independent variable.
CBI is a central bank-independent index and an independent variable.

$$Var\ (y_i) = \alpha_0 + \alpha_1 Var\ (\pi_i) + \alpha_2\, CBI_i + \gamma_j \qquad \text{(Eq.11)}$$

Where

- Var ( y_(i )) is output variability and is a dependent variable.
- Var (π_i) is inflation variability and an independent variable.
- CBI is a central bank-independent index and an independent variable.
- Variability use as dependent variable, whereas parameters of independent represent the α_1,α_(2,)

Hence the Null hypothesis of having no cointegration is rejected at a 5% level of significance. The results of OLS regression models (1 To 6) are summarized in Tables 2A & 2B.State Bank of Pakistan and World Bank has been use for data extraction from period of 1961 to 2019.

## RESULTS AND INTERPRETATIONS

**Table. 1 ADF Unit Root Test on π and y; π y**

| Lag(s) | t-Stat | P-Val | Lag(s) | t-Stat(s) | P-Val |
|---|---|---|---|---|---|
| 10 | -5.364 | 0.000 | 10 | -4.198 | 0.001 |

*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

Source: Author own calculation using software

**Table. 2-A OLS Regression**

Estimated output, variability of inflation as dependent variable:

| Equation | Equ 1 | Equ 2 | Equ 3 | Equ 4 |
|---|---|---|---|---|
| Output Variability | -1.088(-0.740) | -0.572(-0.378) | | -0.572(-0.378) |
| Independence Index | | 183.726(1.334) | -3.111(-0.048) | 183.726(1.334) |
| No observations after adjustments | 58 | 58 | 58 | 58 |
| Level of Significance | 95% | 95% | 95% | 95% |
| R2 | 0.0096 | 0.0407 | 0.0015 | 0.0407 |

**Table. 3-B OLS Regression**

Estimated output, variability of output as DV:

| Equation | Equ 4 | Equ 6 |
|---|---|---|
| Inflation Variability | | -0.0045(-0.3787) |
| Independence Index | 197.850(1.492) | -22.4437(-1.8554) |
| No observations after adjustments | 58 | 58 |
| Level of Significance | 95% | 95% |
| R2 | 0.1412 | 0.1440 |

Source: Author own calculation using software

**Table No. 4:Unit Root Test (ADF): Variance of Inflation** Ho
There is a unit root in variance of inflation.
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=10)

| **Variance of Inflation** | | **t-Value** | **Prob.** |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic-5.364263 | | | 0.0000 |
| Test critical values | 1% level | -3.552666 | 0.0133 |
| | 5% level | -2.914517 | 0.0748 |
| | 10% level | -2.595033 | |

Source: Author own calculation using software

**Table No. 5: ADF-Test Equation:**

| Variable | Coeff | Std. Eror | t-Value | Prob. |
|---|---|---|---|---|
| INFLATIONS(-1) | 0.724304 | 0.135024 | -5.364263 | 0.0000 |
| D(INFLATIONS(-1)) | 0.331830 | 0.129556 | 2.561289 | 0.0133 |
| C | 22.22715 | 12.22941 | 1.817515 | 0.0748 |
| R2 | 0.352484 | | | |
| Adjusted R2 | 0.352484 | | | |
| F-statistic | 14.42565 | | | |
| Prob | 0.000010 | | | |

Source: Author own calculation using software

**Table No. 6: ADF-Test Equation:**

| Variable | Coeff | Std. Eror | t-Value | Prob. |
|---|---|---|---|---|
| OUTPUT(-1) | -0.747033 | 0.177908 | -4.198982 | 0.0001 |
| D(OUTPUT(-1)) | -0.117198 | 0.137175 | -0.854371 | 0.3967 |
| C | 3.186953 | 1.428098 | 2.231607 | 0.0299 |
| R2 | 0.428778 | DV:D(Output) | | |
| Adjusted R2 | 0.407222 | Method:LS | | |
| F-statistic | 19.89175 | Sample (Adjusted): 1964-2019 Included Observations: 56 after adjustment | | |
| Prob | 0.000000 | | | |

**Table No. 7: Johansen Cointegration Test**

Series: VAR_INFLATION VAR_OUTPUT
Lags interval (in first differences): 1 to 1

**DV: VAR_INFLATION**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 34.24816 | 14.51470 | 2.359551 | 0.0218 |
| VAR_OUTPUT | -1.088743 | 1.470827 | -0.740225 | 0.4623 |
| R2 | 0.009690 | **Sample : 1962 2019 Included observations: 58 after adjustments Method: Least Squares (LS** | | |
| Adjusted R | -0.007994 | | | |
| F-statistic | 0.547933 | | | |
| Prob | 0.462256 | | | |

**Table No. 8:DV: VAR_INFLATION**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -25.10233 | 46.76045 | -0.536828 | 0.5936 |
| VAR_OUTPUT | -0.572373 | 1.511090 | -0.378782 | 0.7063 |
| CBI | 183.7260 | 137.7028 | 1.334222 | 0.1876 |
| **Statics** | $R^2$ | 0.040737 | | |
| | Adjusted $R^2$ | 0.005855 | | |
| **Variable** | F-statistic | 1.167857 | | |
| | Prob | 0.318625 | | |

**Table No.9: Dependent Variable: VAR_INFLATION** Variable

| Coefficient | | Std. Error | Prob. | |
|---|---|---|---|---|
| C | -25.10233 | 46.76045 | 0.5936 | |
| VAR_OUTPUT | -0.572373 | 1.511090 | 0.7063 | |
| CBI | 183.7260 | 137.7028 | 0.1876 | |
| Adjusted R2 | 0.005855 | Method: LS Sample : 1962 2019 Included observations: 58 after adjustments | | |
| F-statistic | 1.167857 | | | |
| Prob | 0.318625 | | | |

**Table No. 10:Dependent Variable: VAR_INFLATION**

Method: LS
Sample : 1962 2019
Included observations: 58 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -31.70528 | 43.05657 | -0.736363 | 0.4646 |
| CBI | 197.0850 | 132.0878 | 1.492075 | 0.1413 |
| Statics Variable | R2 | 0.038235 | Mean dependent var | 29.59156 |
| | Adjusted R | 0.021061 | S.D. dependent var | 99.22311 |
| | S.E. of regression | 98.17270 | AIC | 12.04521 |
| | Sum squared resid | 539721.2 | SC | 12.11626 |
| | Log-likelihood | -347.3110 | HQ criteria | 12.07288 |
| | F-statistic | 2.226289 | DW Stat | 1.131078 |
| | Prob | 0.141292 | | |

**DV: VAR_INFLATION**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -25.10233 | 46.76045 | -0.536828 | 0.5936 |
| VAR_OUTPUT | -0.572373 | 1.511090 | -0.378782 | 0.7063 |
| CBI | 183.7260 | 137.7028 | 1.334222 | 0.1876 |
| R-squared | 0.040737 | Method: LS<br>Sample : 1962 2019<br>Included observations: 58 after adjustments | | |
| Adjusted R2 | 0.005855 | | | |
| F-statistic | 1.167857 | | | |
| Prob | 0.318625 | | | |

**DV:VAR_OUTPUT**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 11.39196 | 3.885451 | 2.931953 | 0.0049 |
| VAR_INFLATION | -0.004546 | 0.012001 | -0.378782 | 0.7063 |
| CBI | -22.44376 | 12.09589 | -1.855486 | 0.0689 |

| | | |
|---|---|---|
| R2 | 0.068028 | Method: LS<br>Sample : 1962 2019<br>Included observations: 58 after adjustments |
| Adjusted R2 | 0.034138 | |
| Log-likelihood | -207.0031 | |
| F-statistic | 2.007331 | |
| Prob | 0.144071 | |

## INTERPRETATION OF RESULTS

We find a negative relationship between inflation and output volatility, although the relationship is not statistically significant. Furthermore, a statistically insignificant but positive relationship is found between the level of central bank independence and inflation volatility. Statistically not significant but inversely related. In addition, there is a statistically insignificant but inverse relationship between inflation and output volatility, a positive relationship between the level of central bank independence and output volatility, and a negative relationship between output volatility and inflation volatility.

## DISCUSSION:

The obtained results can be confirmed by Friedman (2006), who also found that there is a direct causal relationship and no trade-off. Our discoveries on the negative connection between's state long-run tenor and normal expansion and the opposite connection among expansion and result inconstancy were upheld by Cukierman (1993), Alesina and Summers (1993), Debelle and Fischer (1994), Ow-Yong (1996), Ow-Yong (1996), Cecchetti and Krause (Cecchetti and Crause (2002 ), Crowe and Crowe and Meade (2008).These secondary outcomes are the result of the SBP's multiple conflicting objectives, the governor's tenure, the SBP's limited or low level of independence, and discretionary monetary policy. Thus, in the case of Pakistan, we reject the null hypothesis that the central bank affects the trade-off between inflation and production volatility.

## CONCLUSION

As a developing country, Pakistan is facing many economic and political problems at the same time. Political unpredictability and difficulty impede structural institutional development, ultimately leading to problems of uneven growth, rising unemployment, price stability, exchange rate management, volatility, twin deficits, financial stability, and especially overall macroeconomic management. These goals can only be achieved through broad cooperation between all levels of government, especially the Ministry of Finance and the Central Bank. The State Bank of Pakistan has operational autonomy to decide which method is best for achieving certain objectives in terms of inflation, interest rates, currency exchange rates and the soundness of the financial system. The federal government's GDP growth and inflation targets remain volatile over time (Abdul (Abdul Hadi et al., 2019).
In doing so, the government deviates from the actual target in order to achieve above-potential growth. The M2 money growth rate target set by Bank Negara is

often exceeded. Both the M2 money growth rate and the actual inflation rate were higher than the predetermined target and the global average of 3.0%. This means that the implementation of monetary policy is haphazard and flawed (Hayat, 2014). In Pakistan, the prime minister chairs the National Economic Council (NEC), a constitutional body that also includes the chief ministers of the provinces, four federal ministers, the finance minister, the governor of the State Bank of Pakistan, and other key economic officials who are regularly invited.

## DECLARATION OF INTEREST:

It is declared that the authors of this research work have no competing interests.

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