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Financial Development and Output Volatility Nexus: Role of Financial Sector Instability

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Abstract

This study explores the influence of financial sector development on output volatility. Particularly, the role of financial sector instability is explored to provide a better understanding of financial sector development and output volatility nexus. The empirical analysis is based on cross-sectional panel data-sets of 180 countries for the years 1971-2020. In addition to random and fixed effects models, the 2-SLS and GMM techniques were used for empirical analysis. The analyses produced mixed results . The results showed that financial sector volatility increases output volatility. On the other hand financial development is critical in protecting output from instability. Trade openness and inflation have also been considered as controlled factors because of their impact on output volatility. Trade openness, like financial stability, decreases production volatility. Inflation, as a monetary phenomenon, tends to amplify output volatility.

***Keyword*:** financial development, financial development volatility, panel data, output volatility

JEL Classification: E30, E51, G20, O16

Introduction

Over the last few decades, economists and policymakers all over the world have become more interested in the concept of output volatility. Many economists argue that output volatility is a key indicator for future economic outcomes (Imbs, 1995). The output primarily affects a country's entire set of economic factors, such as investment patterns, employment ratios, and growth patterns. . Any change in output results in disruption of this entire set of factors. Studies show that output volatility does not follow a similar pattern across the regions. Over the decades, it has declined

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in the regions of East-Asia Pacific, Latin-American & Caribbean, North-America, and the Middle-East & North-Africa. The reverse is true for the regions of Europe and Central-Asia, Sub-Sahara Africa, and South-Africa, where no clear pattern of output volatility is observed (Majeed & Noreen, 2018).

High macroeconomic volatility depresses investment, favours short-term profits, and slows economic growth (Serven, 2002). Volatility is a direct cost for risk-averse persons (Loayza et al, 2007), as well as an indirect cost in terms of restricting income growth and development. Furthermore, (Krebs et al., 2005) links higher macroeconomic instability to poorer human capital investment. This macroeconomic instability is thought to be the outcome of both local and international shocks occurring at the same time. Weak institutional strength, on the other hand, makes it more severe (Loayza et al., 2007).

Logically the reasons behind such macroeconomic volatility have some major implications. As the financial sector remains crucial for the development similarly, it may bring disruptions in macroeconomic activities. The world economy has many times witnessed output volatility due to financial crises in history. Therefore, the financial crises have ignited some reasonable debate over the role of financing, in dampening output volatility. Output volatility and financial crisis came out to be serious obstacles to development because they are intimately related to high consumption volatility, high poverty, short and long-term growth, and high inequality.

Much of the debate is prevailing in the literature about financial development and output volatility. Another key research subject that has recently piqued the interest of economists and policymakers is what relationship lies between financial development volatility and output growth. How important is financial development volatility to output volatility? The financial development volatility proves to be highly significant towards output implying that high volatility in financial results in industrial output volatility in industries with high liquescent needs (Fang & Miller, 2014). Financial instability results in the disturbance of policy variables (in-reaction to shocks) like fiscal and monetary resulting in a massive disturbance of economic growth (Furi, 2021). Furi et al. (2022) also indicated the same outcome of financial instability on economic growth

which can be vulnerable. The previous literature points to several determinants of output volatility, such as fiscal policy, consumption volatility, remittances, oil prices, and FDI. Aside from these factors, financial instability is caused due to several external factors, for instance, global recessions, capital inflow slow-down, or other domestic reasons like governmental policies which are the most significant element in destabilizing the output. Whereas the earlier literature in this regard is quite limited and provides ambiguous results. It remains unsure whether financial intermediary instability does result in an increase or decrease in output volatility, or whether financial development aids in dampening the impact of external shocks on the economy.

Theoretically, it is presumed that the development of the financial sector not only boosts the growth benefits of financial globalization but it also lessens the vulnerability of crises like output volatility. It is self-evident that domestic financial markets with a high level of development are beneficial and aid in the optimal allocation of foreign investment funds to competing projects (Wurgler, 2000). Conversely, some other analysts argue that in financially open economies, financial development has a direct negative impact on macroeconomic stability. Boom-bust cycles are induced or exacerbated by abrupt shifts in the direction of capital flows in emerging countries that lack extensive and well-functioning financial systems (Caballero & Krishnamurthy, 2001; Aghion & Banerjee, 2005).

Concerning the slow down and volatility of the output the scholarly research study discusses financial development as the best tool to mitigate such upheaval in the financial output. This research reveals that financial development at its best could slow down the impact of any shock on output, likely to lessen the output volatility. For example, a well-functioning credit system results in reduced output volatility. A better-developed financial sector can absorb external shocks, reduce information asymmetry, and channel funds and credit in a better manner and towards better projects (Loayza, 2004, 2007).

After the financial sector remains crucial to output, it is also argued through the contemporary literature that financial development may also help in growth too. This reveals a positive significant impact of the financial sector on the economic growth ass supported by many economists like (Imbs, 1995; Aghion et al., 1999). They asserted that, "a well-functioning financial market encourages diversification, decreases risk, mitigates

information asymmetries, and allows individuals to behave more effectively, it also helps to stabilize the economy and reduce output volatility, and encourages growth aspects" (Imbs, 1995; Aghion et al., 1999). While (Ibrahim & Alagidede, 2018) argued that the amount to which finance promotes growth is critically dependent on the simultaneous growth of the real and financial sectors.

Financial development volatility seems an important phenomenon for the output. Though, there is little evidence and work on the relationship between the finance-output volatility, but this little evidence shows that the financial sector volatility brings major fluctuations in output (Arellano et al., 2019; Jermann & Quadrini, 2006) However, the magnitude may differ country-wise due to the strength of the financial sector's absorption but, the effect remains positive. Arellano et al. (2019) support the relationship of his model by explaining the majority of the Great Recession's decrease in production and labour (as volatility causes firms to reduce their inputs to reduce risk) and also observed an increase in firm interest rate spreads. Similarly, Jermann & Quadrini (2006) in their model, confirmed that financial development volatility could propose negative repercussions on output. They revealed that financial issues are important in causing economic swings. Financial market innovations enable greater financial flexibility and result in lower production volatility while increasing volatility in firm financial structures.

The goal of this research is to discover if there are any links between rising financial sector instability and rising production volatility. There isn't much academic research done on the subject of tying these two factors together. As a result, this research contributes to the existing literature by looking into the relationship between financial and production volatility to examine whether financial development increases or decreases output volatility. In preceding research studies, financial development is modelled to explain output volatility and in overlooking the role of financial sector instability in influencing production volatility. The growth of the financial sector is not sufficient to understand financial development and output volatility nexus as volatility of the financial sector plays a major role in stabilizing/destabilizing the economies. To this end, this study explores the role of the financial sector as well as its volatility on production volatility. Financial development is measured while using the domestic credit for the private sector which reflects that credit flows from local banking channels

to private local investment and company ventures. This can better estimate and represent the volatility of output. Any volatility in credit flow which is the distributor in output, may results in output volatility. To investigate how financial sector volatility affects output volatility we looked at the relationship between financial development volatility and output volatility, as well as the relationship between financial development and output volatility. However, this research study's interest variably relies on policy variables which remain stable for the financial development volatility.

The following hypothesis will be tested in this investigation. Firstly, financial development has a favorable impact on output volatility. Secondly, financial development volatility has a detrimental impact on output volatility. The finance-output volatility nexus may be better explained by shock mechanisms in the monetary sector, such as loans for investment purpose. As a result, we tested this hypothesis of shock mechanisms in domestic lending to the private sector which serve as a proxy for financial development and have an impact on output volatility.

The remaining study is divided and organized as follows. Section 2 presents review of literature on output volatility and financial development. Section 3 illustrates the analytical framework. Section 4 presents the data and variables used. Section 5 presents the interpretation and discussion of the results. Finally, Section 6 concludes this study with the policy implications.

Literature Review

Although, a vast amount of research concentrates on the growth effects of finance, still the potential linkages between financial development volatility and production volatility seem to have not been properly assessed. As a result, we concentrate on the links between financial development and output volatility in our research. According to Mishkin (2009) output stability is crucial among many other macroeconomic policy objectives.

This research's theoretical foundations are based on two strands of literature. Not surprisingly, each strand of the literature has produced its own set of policy implications. The first strand of research focuses on finance and development, with the assumption that well-developed financial systems improve an economy's ability to absorb shocks and reduce output volatility. In this strand of literature, most, if not all, of the papers are theoretical. For example, Aghion et al. (1999) developed a

macroeconomic model that incorporates financial market flaws as well as unequal investment opportunities. In the absence of an established financial sector, their model forecasts considerable production volatility. They argued that savers and investors are separated when the financial sector is underdeveloped, and the credit and supply demand of the sector is more cyclical. Therefore, when the economy is hit by an atrocious shock, investors are likely to stay away from the credit markets, whereas when the economy is hit by a positive shock, they rush into it. As a result, in such a situation, volatility intensifies.

Another key link between financial sector development and volatility is highlighted by Acemoglu and Zilibotti (1997), who underlined the necessity of diversity in decreasing risk. They said that due to the indivisibility of capital, diversification is not possible in the early phases of development. However, once the accumulation of wealth starts, diversification becomes possible and investment starts growing hence, resulting in lower investment volatility and risk. In another paper, Aghion et al. (2000) emphasized the significance of the open economy in explaining the volatility-finance nexus. They claimed that with intermediate levels of financial growth, volatility increases in open economies. Similarly, Jermann and Quadrini (2006) argued that financial market innovations enable greater financial flexibility and lower output volatility while increasing firm financial development volatility.

The second strand of the literature has explained the link of financial instability with volatility in output through the link of information asymmetries. The notable research studies in this strand of the literature are Bernanke and Gertler (1989), Greenwald and Stiglitz (1993), and Kiyotaki and Moore (1997). These studies developed general equilibrium models which were asymmetries of information in financial markets exacerbate volatility. Moreover, it concerns the detrimental effects of financial sector development on volatility. According to Shliefer and Vishny (2010), and Wagner (2010), financial development can lead to over-leverage or heightened risk-taking behaviour among entrepreneurs and banks. Over-leverage or high risk-taking behaviour results in increased volatility. While financial intermediaries and institutions, as shown in several recent studies, can help to minimize frictions, however propagation and amplification processes within the financial sector, as well as from the financial sector to the real sector could worsen

the volatility (see Quadrini, 2011; Brunnermeier et al., 2012). Several papers were found with convincing results for the finance-output volatility relationship to be positive like Imbs (1995), Lensink et al. (1999), Martin and Rogers (2000), Badinger (2010), and Posch and Walde (2011) supported that output growth which tends to be lower during times of higher volatility.

The empirical research on finance and output volatility also yields contradictory results. For example, Denizer et al. (2002) using fixed effect estimation with panel data collected from 70 countries from 1956-1998 discovered that improving a country's financial system reduces variations in per capita production growth. Similarly, Bekaert et al. (2006) showed that financial liberalization often leads to less volatile (consumption) growth. According to James (2011), using data for India from1950-2005 under VAR methodology reports that enacting financial repression measures is highly linked to reducing consumption volatility. According to Dynan et al. (2006), financial innovation played a role in the mid-1980s stabilization and contributed in reducing output volatility.

Majeed and Noreen (2018) using panel data-sets of 79 countries from the year 1961- 2012 support the relationship. This study revealed the positive impact of the less developed financial sector (more volatile) on output volatility. Similarly, Majeed and Mazhar (2019) used data of 155 countries for the years 1971-2017, and Majeed, Mazhar & Sabir (2021). Their empirical analysis was based on Pooled Ordinary Least Squares and on Random and Fixed Effects Models (RFEM). Their study also revealed similar evidence and conclusion about financial stability turns to reduce volatility in output. Financial intermediaries like domestic credit by the banking sector, domestic credit by the private sector, and domestic credit by the financial sector help in turning down the shock in output by enhancing the systematic flow of funds and providing reliable information.

Conversely, in certain empirical studies, financial development increases the production volatility. Bernanke and Gertler (1989) discovered, for example, that times of financial crisis are also times of relatively high agency cost in investment, and that financial limitations on businesses can play a crucial role in the development of the business cycle and eventually lead to higher fluctuations. Similarly, Aghion et al. (2004) discovered that countries in the early stages of financial development are more likely to become unstable in the short term. Similarly, Levchenko et al. (2009) find

substantial evidence to claim that financial liberalization raises production volatility.

There is a third kind of empirical literature that concludes a different conclusion from the previous two. Some empirical studies, in contrast to the previous debate, do not show a substantial link between finance and production (output) volatility. Acemoglu et al. (2003), for example, show that once institutional variables are controlled, the volatility effect of financial development decreases. Beck et al. (2006) also found no evidence of a link between financial development and overall economic instability. As a result, the pragmatic literature on finance and volatility does not give a clear picture of the finance-volatility relationship.

The above discussion leads clearly toward the fact that the previous researches lack debate about the effect of financial development volatility on output volatility. Financial development remained all time a hot topic in the effect of research and policy. A few studies have discussed such a relationship between financial instability and output instability. Raddatz (2007) asserted an opinion for low-income nations the financial instability or for (external shock) which reveals a very minor impact on output reduction. However, shock from inside the country (internal shock) leads to huge output fatalities.

Moschovou and Giannopoulos (2021) conclude another way; any economic crisis that leads to financial instability results in a reduction in output. For the major EU countries like Spain, Greece, Portugal, and Italy the study found that financial crises time spanning from 2005--2019, led in reduction of output for several economic sectors through development in transport freight. Similarly, Safi et al., (2021) analyzed the effect of financial instability along with technology innovation plus the exports on consumption-based output revealing that high financial development volatility results in the latter's reduction.

To summarize, the above literature demonstrates that financial development and financial development volatility can have a variety of effects on production volatility. Following the above thread of research, it can be said that,a well-developed financial sector may better match savers and investors ultimately helping the economy to absorb shocks and reduce volatility risks. A turbulent financial sector, on the other hand, influences output and causes volatility in it. Diversification becomes easier as new

financial markets and institutions arise, reducing risk and volatility. The key purpose of this study is to supplement and improve existing cross-country research by giving further data on how financial sector volatility influences output volatility, based on the experience of the world's largest, smallest, established, and developing nations. Our analysis is focused on 180 countries (global analyses) rather than single-country or regional analyses since volatility impacts developing and developed countries differently.

Methodology

Econometric Model

The standard deviation (SD) of the per capita GDP is our benchmark metric of the volatility (Levine et al., 2000). In our empirical research, we use the log of per capita GDP as a measurement tool to check the estimated growth of volatility which is also conventional (Posch, 2011; Beck et al., 2006, Majeed and Noreen, 2018). As a result, a panel equation can be used to represent the link between financial development and output volatility. The model follows the following panel equation that we use for the empirical analyses.

$$\textit{Log of Output Volatility} = \alpha_1(LGDP)_{it} + \alpha_2(LOV)_{it-1} + \alpha_3(TO)_{it} + \alpha_4(INF)_{it} + \alpha_5(FD)_{it} + \alpha_6 SD(FD)_{it} + \mu_{it} + \varepsilon_{it}$$

Where GDP is the measure of growth that is quantified through the log of per capita GDP, and the log of output volatility is the standard deviation of the per capita GDP. We also used the dependent variable's latency which is denoted by $\alpha_2(\mathrm{LOV})_{\mathrm{it}-1}$. TO and INF trade openness and inflation respectively. Majeed and Noreen (2018); Majeed and Mazhar (2019) also incorporated trade openness and inflation to check the real sector as well as the monetary sector's influence on output volatility. Similarly, FD is the financial development and the SD(FD) indicates the financial development volatility. Beck et al., (2006) also used financial depth as an estimation tool for financial development. Likewise, in our estimated model 'μ' indicates the country-specific effect whereas 'ε' is the error term. Similarly, the terms 'i' and 't' stand for nation and period, respectively.

In the above equations, α_1 has been referred to as the influence of the log of per capita GDP on the log of output volatility, α_2 has been referred to as the influence of the lag of log of output volatility on the log of output

volatility. Whereas α_3 has been referred to as the influence of trade openness on the log of output volatility and α_4 has been referred to as the influence of inflation on the log of output volatility. However, α_5 has been referred to as the influence of the financial development on the log of output volatility and lastly α_6 has been proposed as an influencing factor on volatility of the financial development on the log of output volatility.

Data and Variable Description

In the current study, we examined if there is a link between output volatility and focused (independent) variables financial development and financial development volatility. Thus, the study has set up a global panel data set comprised of different emerging and developed countries. Over the period 1971-2020. This study used samples from 180 countries for data analysis. A summary of the data sources of all the variables used in our study is reported in the following table.

Table 1

Summary of Data Sources of Variables

Variables	Denoted by	Measured in	Sources
Dependent Variable			
Output Volatility	GDP	The standard deviation of GDP per capita, measured in constant 2010 US dollars	WDI (2022)
Focused Variables			
Financial Development	FD	Domestic credit to the private sector is measured in % of GDP	WDI (2022)
Financial Development Volatility	VFD	The standard deviation of domestic credit to the private sector, measured in % of GDP	WDI (2022)

Variables	Denoted by	Measured in	Sources
Control Variables			
GDP per capita	GDPPC	Constant 2010 US dollars	WDI (2022)
Trade Openness	TO	Sum of exports and imports of goods and services measured as % of GDP.	WDI (2022)
Inflation	INF	consumer price index measured in 2010 = 100	WDI (2022)

This segment also exhibits the statistical summary or the descriptive analysis of all the variables. The descriptive stats proposed in this part contain information about the two measures of the central tendency including mean and median, minimum values of the variables as well as the maximum values of the variables. Furthermore, standard deviation (SD) reflects data in dispersion and also the total number of observations mentioned in summary statistics. The findings of the descriptive analysis for all the variables included in our study are shown in the table below.

Table 2

Summary Statistics of Dependent and Independent Variables

Variables	Obs.	Mean	Median	Std. Dev.	Minimum	Maximum
Dependent Variable						
Output Volatility	4604	470.1542	116.3038	1764.141	0.203582	49037.71
Focused Variables						
Financial Development	4604	45.86033	30.73139	42.87084	0.000000	304.5751
Financial Development Volatility	4604	3.460867	1.872736	6.602724	0.000000	144.3976

Variables	Obs.	Mean	Median	Std. Dev.	Minimum	Maximum
Control Variables						
GDP per capita	4604	11646.53	3790.377	17030.81	270.6914	112417.9
Trade Openness	4604	81.88693	69.96043	55.88559	0.784631	442.6200
Inflation	4604	80.12940	82.83019	82.72714	3.57E-10	3364.820

The mean value of the output volatility is 470.15 whereas, the median value of output volatility is 116.30. Similarly, the standard deviation of output volatility is 1764.14. Additionally, minimum and maximum values of the output volatility are 0.20 and 49037.71 respectively. The mean values of financial development and financial development volatility are 45.86 and 3.46 respectively. While median values of financial development and financial development volatility are 30.73 and 1.87 respectively. Whereas the values of the standard deviation of financial development and financial development volatility are 42.87 and 6.60 respectively. Moreover, minimum values of financial development and financial development volatility are 0 and 0 respectively. Additionally, the maximum values of financial development and financial development volatility are 304.57 and 144.39 respectively.

A correlation coefficient is a numerical approach for evaluating the degree as well as the direction between variables. The correlation coefficient matrix is essential for understanding multi-collinearity. The following table shows the correlation matrix for all dependent, independent, and control variables.

Table 3 proposed that the log of output volatility is positively correlated or associated with focused (independent) variables including financial development and financial development volatility and also with all control (independent) variables including the log of GDP per capita, trade openness, and inflation. When coefficients of the variables are correlated positively, it demonstrates that the output volatility increases equally.

Table 3
Correlation Matrix

Variables	*1*	*2*	*3*	*4*	*5*	*6*
1. Log of Output Volatility	1.0000					
2. Log of GDP Per Capita	0.8123	1.0000				
3.Financial Development	0.5219	0.6747	1.0000			
4.Financial Development Volatility	0.3500	0.1715	0.2793	1.0000		
5. Trade Openness	0.3401	0.3660	0.2777	0.0670	1.0000	
6. Inflation	0.0477	0.1156	0.1271	-0.0312	0.0789	1.0000

Results and Discussions

Financial development is considered to be the best tool to mitigate output volatility. The developed financial sector can absorb external shocks, reduce information asymmetry, channel funds and credit in a better manner, and towards better projects (Loyza, 2004, 2007). It also stabilizes the economy and reduces output volatility (Imbs, 1995; Aghion et al., 1999). On the other hand, financial development volatility brings major fluctuations in output. The empirical research on finance and output volatility yields contradictory results. Financial development and financial development volatility can have a variety of effects on production volatility. A well-developed financial sector may better match savers and investors, helping the economy to absorb shocks and reduce volatility.

In this section, we have reported the results and the discussion by concluding the fact that financial development and its volatility may affect output volatility. We have used the domestic credit to the private sector as a proxy to measure the impact of financial development on output volatility. Additionally, we have used three control variables including GDP per capita, trade openness, and inflation. We have also used the global panel data over the period from 197-2020 in our current research. Pooled ordinary

least square estimation (POLE), fixed effect method (PEM), and random effect method (REM) are utilized in the ongoing research. Moreover, for endogeneity, the two-stage least square (2SLS) method as well as the generalized methods of moments (GMM) have been employed. Lastly, we used sensitivity analysis to check the robustness of the empirical findings. Moreover, current research also utilized a package of the Stata 15 and the data which is used in the study is derived from WDI (2022).

Pooled Ordinary Least Square Nexus

Various degrees of freedom are present in the panel data collection, which allows it to represent the complexities of human interaction. Similarly, panel data provides exact results by pooling the data. The regression analysis, which stipulates the consistent coefficients and intercepts supposition, is used to estimate the pooled OLS. If the model is accurately estimated but somehow the independent variables would not correlate with the residuals then the ordinary least square method would be used to overcome the issue. The estimation of pooled ordinary least squares is reported in the Table 4.

Table 4 proposed the results of pooled ordinary least square estimation. The results suggest that there is a positive link between per capita GDP and output volatility. It indicates that due to a 1% increase in per capita GDP increase output volatility by 0.551 units. Output volatility possesses a significantly long-lasting concept, so we utilized a panel dataset in our research. Higher GDP tends to increase output volatility. This increase in output volatility can be considered as a channel enhancement in GDP because it can be very un-predictable and affects output volatility. For instance, the financing sources for the investment projects. For example, the financing sources for the investment projects. If any instability occurs in such financing sources the GDP tends to increase but at the same time this financial development volatility could bring volatility in output, or the volatility could also increase. We have employed the lag of output volatility in the current study which also has a significant as well as a positive effect on the output volatility. It specifies that a 1% increase in the lag output volatility, will result in an increase in output volatility by 0.428 units.

Table 4

Pooled Ordinary Least Square Results of Log of Output Volatility

Variables	Log of Output Volatility
Lag of Log of Output Volatility	0.551***(49.91)
Log of GDP per capita	0.428***(30.14)
Financial Development	-0.00252***(-7.30)
Financial Development Volatility	0.0345***(19.90)
Trade Openness	0.000826***(4.06)
Inflation	-0.000100(-0.78)
R^2	0.8174
F-Statistics	3412.66
F-Probability	0.0000
No. of observations	4582

Note. *t*-values are given in parenthesis. *, **, *** corresponds to significance at 10%, 5% and 1% respectively.

The results also indicate that there is a negative but significant relationship between financial development and output volatility. Output volatility declines when the growth rate increases. This outcome is significant and consistent with the previous literature. Therefore, it is observed that when a country's rate of growth rises, it also helps various sectors of the economy to improve thereby, reducing the whole output volatility of the economy. The coefficient of financial development implies that due to a 1% increase in financial development, output volatility declines by 0.00252 units. These results are consistent with Majeed and Noreen (2018). Financial development measures the financial sector size, as this sector grows, it attracts greater resources, allowing riskier investments, which can increase output volatility. The output volatility is highly

significant to the financial development volatility, implying that higher volatility raises the industrial volatility more in industries with higher liquidity needs (Fang et al., 2013). The coefficient of the financial development volatility indicates that due to a 1% increase in the financial development volatility, will also increase the output volatility by 0.0345 units. These results are consistent and estimated expectedly.

Similarly, from the estimated results, it is found that trade has a positive and significant impact. As the results indicate that output volatility will be increased due to the deterioration and the interference in real sectors. According to Hadded et al., (2013) due to the trade openness in the economy, the volatility will be increased because an economy that depends on trade to infer economic activity has more exposure which lead to external shocks in the economy and thus can be more volatile. The findings indicate that an increase in the intensity of trade openness is leading to higher output volatility. The results are consistent with Majeed and Noreen (2019). However, inflation shows instability in the monetary sector. From our findings, inflation has a negative but significant impact on output volatility. The results indicate that output volatility will be decreased due to the deterioration and the interference in monetary sectors. It is proposed that inflation and output volatility follow the opposite path in that minimum inflation leads to lower volatility in growth and vice-versa (Majeed & Noreen, 2018).

Moreover, the findings reveal that the value of *R*- square is 0.8174 which indicates that there is 81% variation in the dependent variable which is the log of output volatility due to the independent variables in our analysis. The total no of observations is 4582 while the value of the *F*-statistics is 3412.66 and the probability of the *F*- statistics is 0.0000.

Fixed Effects and Random Effects Results of Output Volatility

In Ordinary least square (OLS) estimation intercept won't change the countries. Similarly, , in cross-sections, coefficients remain the same. So, given this limitation or the restriction, we move forward to the other method of estimation like fixed or the random effect method techniques for the empirical analysis. The estimation of the fixed effect and the random effect is reported in the table below. Firstly, we consider the results of the fixed effect method in column (1).

From the findings, it is suggested that due to a 1% increase in the lag of output volatility, per capita GDP, Financial development volatility and trade has increased the output volatility by 0.483, 0.487, 0.0389, and 0.00111 units respectively. By contrast, due to a 1% increase in financial development and inflation, it will decrease the output volatility by 0.00444 and 0.000144 respectively. Furthermore, the results show that the R-square value is 0.8153, indicating that the independent factors in our research cause 81% variation in the dependent variable. The total number of observations is 4582, while the F-statistics value is 533.73, and the F-statistics probability is 0.0000.

Table 5

Fixed Effect and Random Effect Results of Log of Output Volatility

	(1)	(2)
Variables	Fixed Effect	Random Effect
Lag of Log of Output Volatility	0.483***(41.25)	0.551***(49.91)
Log of GDP per capita	0.487***(10.19)	0.428***(30.14)
Financial Development	-0.00444***(-6.90)	-0.00252***(-7.30)
Financial Development Volatility	0.0389***(21.43)	0.0345***(19.90)
Trade Openness	0.00111(1.85)	0.000826***(4.06)
Inflation	-0.000144(-1.00)	-0.000100(-0.78)
R^2	0.8153	0.8174
Chi2(6)	------	20475.97
Prob > Chi2	------	0.0000
F-Statistics	533.73	------
F-Probability	0.0000	------
No. of Observations	4582	4582

Note. *t*-values are given in parenthesis. *, **, *** corresponds to significance at 10%, 5% and 1% respectively.

Now we'll look at the results of the random effect model, which are listed in column 2. The latent variables in the fixed effect model will indeed be affected by an increase in the number of observations. To deal with this problem, we use the random effect method. Conclusions imply that due to a 1% increase in the lag of output volatility, GDP per capita, financial development volatility, and trade increases which also increase output volatility by 0.551, 0.428, 0.0345, and 0.000826 respectively. Conversely, the findings show that due to a 1% increase in financial development and inflation, there is a decrease in the output volatility by 0.00252 and 0.000100 respectively.

Furthermore, the results show that the R-square value is 0.8174, indicating that the independent factors in our research cause an 81% fluctuation in the dependent variable, which is output volatility. The total number of observations is 4582, while the chi-square value is 20475.95 and the Chi-square probability is 0.0000.

Two-Stage Least Square Results

An endogeneity problem probably exists in our predicted model. Keeping in view the fact that financial development, financial development volatility, and output volatility are all linked at the same time, an endogeneity problem arises and OLS results become distorted. As a result, we'll use a two-stage least square estimate to address this problem. The results of the two-stage least square estimation are presented in the table below.

The findings of 2SLS were given in Table 6. The lag of financial development volatility was employed as an instrumental variable in the investigation. From the findings, it is suggested that due to a 1% increase in the lag of output volatility, per capita GDP, and trade, increases which also increase the output volatility by 0.568, 0.413, and 0.000954 units respectively. In contrast, due to a 1% increase in financial development, financial development volatility, and inflation, there are 0.000580, 0.00170, and 0.0000347 units respectively in the output volatility.

However, the r-squared values show that there is an 82% variation in the output volatility. The value of Wald Chi-square is 21268.15 whereas its probability value is 0.0000. Lastly, no. of observations is 4466.

Table 6
Two-Stage Least Square (2SLS) Results

Variables	Log of Output Volatility
Lag of Log of Output Volatility	0.568***(48.67)
Log of GDP per capita	0.413***(28.31)
Financial Development	-0.000580(-1.60)
The Financial development volatility	-0.00170(-0.53)
Trade Openness	0.000954***(4.83)
Inflation	-0.0000347(-0.28)
R^2	0.8263
Wald Chi2(6)	21268.15
Prob > Chi2	0.0000
No. of observations	4466

Note. *t*-values are given in parenthesis. *, **, *** corresponds to significance at 10%, 5% and 1% respectively.

Generalized Methods of Moments (GMM) Results

The technique of instrumental variable has been widely used whenever we faced the endogeneity problem in our analysis. Researchers used extensively 2SLS but that is not a suitable approach, so to tackle the endogeneity problem, we used the General Method of Moments (GMM) in our current research. It is a suitable approach to handle the heteroscedasticity issue, measurement errors as well as endogeneity. Results of GMM of output volatility and all focused (independent), as well as the control (independent) variables, are in the following table.

Table 7
Generalized Methods of Moments (GMM) Results

Variables	Log of Output Volatility
Lag of Log of Output Volatility	0.568***(21.44)
Log of GDP per capita	0.413***(14.14)
Financial Development	-0.000580(-0.95)
Financial development Volatility	-0.00170(-0.17)
Trade Openness	0.000954***(5.17)
Inflation	-0.0000347(-0.28)
R^2	0.8263
Wald Chi2(6)	23133.08
Prob > Chi2	0.0000
No. of observations	4466

*Note: t-values are given in parenthesis. *, **, *** corresponds to significance at 10%, 5% and 1% respectively.*

Table 7 presented the findings of GMM. We used the lag of financial development volatility as an instrumental variable in the empirical analysis. According to the findings of our empirical analysis, it is suggested that due to a 1% rise in the control variables including lag of output volatility, per capita GDP, and trade, causes 0.568, 0.413 and 0.000954 units increase in the output volatility respectively. Additionally, by contrast, due to a 1% increase in financial development, financial development volatility, and inflation, there are 0.000580, 0.00170, and 0.0000347 units respectively in the output volatility.

Furthermore, the value of r-square suggests that the output volatility varies by 82%. The Wald Chi-square value is 23133.08, and the probability

value of the Wald Chi-square is 0.0000. Finally, there are 4466 observations in the empirical estimation of our conducted research.

Sensitivity Analysis

A sensitivity analysis is undertaken to incorporate additional input factors like urban population, life expectancy, population growth, and gross fixed capital formation to examine the robustness of the empirical conclusions. The following table described the conclusions of the model output volatility by the inclusion of extra variables.

Table 8 reported the results of the sensitivity analysis by incorporating the additional variables. In all estimated models, the effect of financial development measures remains quite significant and detrimental. However, by contrast, in all calculated models, the influence of volatility on financial development metrics remains positive and significant. As a result, sensitivity analysis validates the results' robustness.

Conclusion

Strong and reliable financial development results in reducing the impact on output volatility, whereas disturbance in the financial sector could disrupt the output of the economy. Financial intermediaries remain crucial to business and investment projects. Therefore, with a strong financial sector we can remove the barrier of information asymmetry which would increase the amount of funds from different financing sources and projects. Knowing the fact that financial sector plays such a pivotal role in growth and output, it is also believed that any sock that brings volatility in the financial sector tends to disturb the flow of funds and investment for projects and production.

This study has been conducted to analyze the effects of output volatility in the financial sector of 180 countries from 1971-2020. Existing literature reveals how financial instability or volatility brings about output disruptions. Empirical analysis also supports the evidence present in the literature about the relationship between output volatility and financial development. Pooled OLS and Radom and Fixed Effect modelling have been carried out to find the empirical evidence for the nexus between the two variables. The independent variable of the study which is the financial development volatility (domestic credit to the private sector) shows a

Table 8

Results of Sensitivity Analysis Output Volatility and Financial Development by incorporating Control Variables

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
Lag of Log of Output Volatility	0.551***(49.91)	0.550***(49.75)	0.550***(49.60)	0.551***(49.94)	0.555***(48.86)
Log of GDP Per Capita	0.428***(30.14)	0.442***(24.80)	0.438***(25.99)	0.424***(29.62)	0.422***(29.19)
Financial Development	-0.0025*** (-7.30)	-0.0025***(-7.35)	-0.0024***(-6.79)	-0.0026***(-7.54)	-0.0025***(-7.33)
Financial Development Volatility	0.0345***(19.90)	0.0346***(19.94)	0.0345***(19.87)	0.0345***(19.92)	0.0333***(19.23)
Trade	0.00083***(4.06)	0.00083***(4.08)	0.000839***(4.11)	0.000851***(4.17)	0.000673***(3.39)
Inflation	-0.000100(-0.78)	-0.0000881(-0.68)	-0.0000557(-0.42)	-0.000122(-0.94)	-0.0000912(-0.73)
Urban Population	---	-0.000927(-1.25)	---	---	---
Life Expectancy	---	---	-0.00216(-1.22)	---	---
Population Growth	---	---	---	-0.0173*(-2.12)	---
Gross fixed capital formation	---	---	---	---	0.00817***(6.31)
R^2	0.8174	0.8172	0.8181	0.8176	0.8323
F- Statistics	3412.66	2920.32	2928.13	2928.03	3048.58
F- Probability	0.0000	0.0000	0.0000	0.0000	0.0000
No. of Observations	4582	4571	4566	4582	4308

Note. t- values are given in parenthesis. *, **, *** corresponds to significance at 10%, 5% and 1% respectively

significant positive impact on the dependent variable. It says that the volatility in the financial sector brings disturbances in output. Moreover, trade openness (real sector) and inflation also exert pressure on output volatility. A developed real sector reduces the output volatility while inflation results in output volatilities. By concluding the above discussion, it is clear that to capture the endogeneity GMM and 2SLS have been used as the techniques to find out the financial stability or volatility which contributes significantly towards increasing the output.

Way Forward

Unsustainable macroeconomic policy, fragile financial systems, institutional defects, and flaws in the structure of international and domestic financial markets are the reasons that bring instability to economies. As a result, it is a central theme of policy-making, particularly for the governments and the monetary authority to improve control of financial instability in variables following the economy's capacity through effective monetary and fiscal policy to promote economic growth. Allowing migrants' access to financial institutions abroad and from abroad to domestic, inhaling remittance inflows, and implementing retail payment systems for households that aid in the stabilization of finance would boost economic growth. Furthermore, creating a favourable investment climate through a stable political and macroeconomic environment has the potential to promote capital creation and government consumption expenditure, thereby increasing long-run economic growth.

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Appendix

Table A1

List of Countries included in the Sample

Albania	Czech Republic	Kuwait	Puerto Rico
Algeria	Denmark	Kyrgyz Republic	Qatar
Angola	Djibouti	Lao PDR	Romania
Antigua and Barbuda	Dominica	Latvia	Russian Federation
Argentina	Dominican Republic	Lebanon	Rwanda
Armenia	Ecuador	Lesotho	Samoa
Aruba	Egypt, Arab Rep.	Libya	Saudi Arabia
Australia	El Salvador	Lithuania	Senegal
Austria	Equatorial Guinea	Luxembourg	Serbia
Azerbaijan	Estonia	Macao SAR, China	Seychelles
Bahamas, The	Eswatini	Madagascar	Sierra Leone
Bahrain	Fiji	Malawi	Singapore
Bangladesh	Finland	Malaysia	Slovak Republic
Barbados	France	Maldives	Slovenia
Belarus	Gabon	Mali	Solomon Islands
Belgium	Gambia, The	Malta	South Africa
Belize	Georgia	Mauritania	South Sudan
Benin	Germany	Mauritius	Spain
Bermuda	Ghana	Mexico	Sri Lanka
Bhutan	Greece	Micronesia, Fed. Sts.	Sudan
Bolivia	Greenland	Moldova	Suriname
Bosnia and Herzegovina	Guatemala	Monaco	Sweden
Botswana	Guinea	Mongolia	Switzerland
Brazil	Guinea-Bissau	Montenegro	Syrian Arab Republic
Brunei Darussalam	Guyana	Morocco	Tajikistan
Bulgaria	Haiti	Mozambique	Tanzania
Burkina Faso	Honduras	Myanmar	Thailand
Burundi	Hong Kong SAR, China	Namibia	Timor-Leste
Cabo Verde	Hungary	Nepal	Togo
Cambodia	Iceland	Netherlands	Tonga

Cameroon	India	New Zealand	Trinidad and Tobago
Canada	Indonesia	Nicaragua	Tunisia
Central African Republic	Iran, Islamic Rep.	Niger	Turkey
Chad	Iraq	Nigeria	Uganda
Chile	Ireland	North Macedonia	Ukraine
China	Israel	Norway	United Arab Emirates
Colombia	Italy	Oman	United Kingdom
Comoros	Jamaica	Pakistan	United States
Congo, Dem. Rep.	Japan	Panama	Uruguay
Congo, Rep.	Jordan	Papua New Guinea	Vanuatu
Costa Rica	Kazakhstan	Paraguay	Vietnam
Cote d'Ivoire	Kenya	Peru	West Bank and Gaza
Croatia	Kiribati	Philippines	Yemen, Rep.
Cuba	Korea, Rep.	Poland	Zambia
Cyprus	Kosovo	Portugal	Zimbabwe