Financial stress and exchange rate volatility in Sub-Saharan Africa: Evidence from new datasets

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Abstract

This study utilizes a newly constructed index for financial stress to examine its predictive value for exchange rate volatility in sub-Saharan Africa (SSA). Using a methodology that accounts for the key features of the predictive model, we find that financial stress significantly and positively affects exchange rate volatility in SSA. This indicates that increased financial stress is linked to higher levels of exchange rate volatility in the region. A robustness check conducted on OECD countries shows that financial stress does not elevate exchange rate volatility in those countries. These findings support the purchasing power parity (PPP) theory in SSA, where financial stress amplifies exchange rate fluctuations, whereas in OECD countries, the effects are weaker and less statistically significant. In light of these findings, policymakers in sub-Saharan Africa should prioritize enhancing the financial system stability to better protect against external shocks.

Keywords: Exchange rate volatility; Financial stress; Sub-Saharan Africa; Purchasing power parity

JEL Codes: D53; C58; G15

1 Introduction

Every economy faces two distinct states that portray their economic strength cum altitude, namely the normal state and the distressed state, as proclaimed by Hakkio and Keeton (2009). In their submission, when economic activity is high and accompanied by low financial stress, such economy is pronounced to be at the normal state, whereas, when there is insufficient economic activity saddled with high financial stress, the distressed state is looming. The global financial turmoil that began in mid-2007 mutated into a full-blown global financial crisis, encompassing broader securities markets and the banking systems of several advanced economies. Past episodes of stress in banking, securities, or foreign exchange markets have only sometimes been associated with economic downturns (Cardarelli et al., 2011). In advanced economies like the United States, more than 8.7 million jobs were lost (US Bureau

of Labour Statistics), which doubled the unemployment rate, as American households lost over $19 trillion in net value due to the stock market meltdown during this distressed state. Meanwhile, the common phenomenon in financial crisis –regardless of the underlying causes – that exacerbates and amplifies economic downturns is that unfulfilled loans and atrocious insider bank deals have been a significant contributor and conventional mechanisms by which financial crises were triggered, especially relative to adverse shocks to asset-values (Gorton, 2010; Mittnik & Semmler, 2013; Reinhart & Rogoff, 2009).

The essential role of the USD as an anchor currency has been more challenging over the years as it was put to the test during the 2007 GFC due to the different financial evolution taking place, making countries loosen the linking of their currency to the USD as they have been pushed due to market pressure or as a tactical approach in stabilising their currency against fluctuations. Additionally, exchange rate volatility has implications for a country's financial system, especially the stock market (Adjasi et al.,2008; Arratibel et al., 2011; Mroua & Trabelsi, 2020). Due to the vulnerability of their economy's financial situation to exchange rate volatility, the foreign exchange market has financial consequences for individuals, businesses, and the government. Benita and Lauterbach (2004) demonstrated that fluctuations in exchange rates have tangible economic consequences on pricing stability, corporate profitability, and the nation's overall stability. Furthermore, capital markets globalization has led to the influx of substantial amounts of cash across countries and the listing of stocks on many exchanges (see Bhargava & Konku, 2023; Dhingra et al., 2024; Petry et al., 2023; Ramzan et al., 2024).

Sub-Saharan Africa has a variety of economies and is facing complex economic phenomena that challenge growth in the region (Juju et al., 2020). Among these challenges, the persistent price increase and unstable exchange rates are fundamental in affecting the region's economy (Fagbemi et al., 2021; Olamide et al., 2022). SSA combines different economies – some are not buoyant, while some are – with an influx of many natural things but also problematic social, economic, and political issues (Juju et al., 2020). Many countries in sub-Saharan Africa have financial stress because their banks and financial institutions struggle with unpaid loans, poor management, and weak rules, making the financial system unstable and harming the economy (Ngouhouo & Nchofoung, 2022). The exchange rate in Sub-Saharan Africa is heavily influenced by depending on selling natural resources, having debts to other countries, and being vulnerable to events from other places (Katoka & Dostal, 2022), as the region's financial strength cum economy depends on crude mineral resources to developed economies, earning

them less exchange rate advantage against the considerable importation of finished products. This may cause unexpected fluctuations in their domestic currency against the USD adversely (see Andriyani et al., 2020; Mpoyi, 2020).

Sequels to the 2007 summer financial crisis, there was a widespread perception that Sub-Saharan Africa would be affected only to a limited extent, with fragile countries making no exception in this respect (see Allen & Giovannetti, 2011; Fischer & Storm, 2023; Geis & Chauvin, 2011). The limited depth and low integration of the SSA economies' financial systems with the US and European capital markets appeared to be sheltering them – so the reasoning went – from a direct transmission of the crisis. Sub-Saharan African economies, especially those with flexible exchange rates, have a strong link between exchange rate changes and inflation (Fagbemi et al., 2021). According to IMF (2023), when the value of money in the region decreases by 1 per cent against the US dollar, prices increase by 0. 22 per cent within the first year. This is more than in emerging Asia (0.15 per cent) and Latin America (0. 18 per cent). In countries that don't peg their currency to another, the pass-through rate is 0.28 per cent, about four times higher than in countries that peg their currency (Ahmed, 2021). This means that changes in exchange rates have an enormous impact on prices in non-pegged countries.

In what follows, after a brief overview of the crisis, we explore the channels through which the current financial crisis was transmitted to SSA, emphasizing the impact on SSA countries and with an eye on the possible policy prescriptions. The situation has, indeed, underscored Africa's vulnerability to external shocks and the low resilience of countries where the social protection mechanisms are not appropriate or not fully implemented. Countries in situations of financial stress, despite their limited integration into the world economy, have also proved the least able to cope with the crisis, given a low fiscal capacity and lack of formal – and often informal – safety nets. Furthermore, a possible interruption in the investments for growth capacity (both in terms of infrastructure and human capital/education) may produce even worse effects in the long run, as SSA countries have a limited formal and informal financial system and, thus, a limited ability to borrow and smooth shocks (Takyi & Leon-Gonzalez, 2020; Woldu & Szakálné Kanó, 2023).

In respect of financial stress index composition, there are several studies conducted to develop measuring financial stress (see Ahmed et al., 2024; Biglarkhani et al., 2023; Hoque et al., 2023;

Reisizadeh et al., 2025; Song & Li, 2024) and there is no consensus because the majority of the studies differ in terms of the variables to be used in each market segment (see Adhikari & Putnam, 2024; Ahmed et al., 2024; Anand et al., 2023), market segments' numbers to be included (see Episkopos, 2024; Herman & Zsido, 2023; Mezghani & Boujelbène-Abbes, 2023; Mundra & Bicchal, 2020), the data frequency (see Balcilar et al., 2023; Das et al., 2023; NguyenHuu & Örsal, 2024), or the methodologies (see Gaies & Chaâbane, 2024; Long et al., 2024; NguyenHuu & Örsal, 2024). The financial stress indicator (FSI) is a single aggregate indicator designed to quantify the financial system's susceptibility to both internal and external shocks reflecting the systemic aspect of financial instability. The financial stability index gives an overall assessment of financial stress in the financial system and, consequently, the real economy as it seeks to expose how the financial system functions due to stress or uncertainty. By creating a financial stress indicator to gauge financial stress in the SSA financial industry, this work adds to the body of literature.

The following is the rest of this article: Section 2 offers an overview of the literature cum the theoretical framework, while Section 3 deals with methods and data, Sections 4 and 5 present the findings and conclusions, respectively.

2 Literature Review

2.1 Theoretical Issues

The financial stress-exchange rate volatility nexus in SSA can be elucidated through the lens of the purchasing power parity (PPP) theory, a foundational theory in international economics, was formally developed by Cassel (1918), though its conceptual origins can be traced to earlier economic thought, including the works by the School of Salamanca in the 16th century. The theory posits that in an efficient market, the exchange rate between two currencies should equalize the purchasing power of those currencies by adjusting for differences in price and inflation levels. This concept is based on the law of one price, which asserts that identical goods sold in different countries should have the same price when converted to a common currency in a competitive market. The absolute and relative PPP are the two primary forms of PPP, where the former states that the price of an identical basket of goods and services should be the same across countries when measured in a common currency and the latter suggests that fluctuations in exchange rates over time should correspond to the differences in inflation rates between countries.

The theoretical balance between financial stress and the exchange rate is often disrupted during periods of financial instability and uncertainty, as sharp economic instability alters price dynamics and capital flows (Adeloye et al., 2024; Aizenman & Binici, 2016; Cardarelli et al., 2011; Chang, 2023; Stiglitz, 2015). Financial stress marked by global or regional market turmoil triggers capital flight from SSA countries, depreciating their currencies and causing significant deviations from PPP (see Ali et al., 2023; Mekongo et al., 2023). This is compounded by SSA's structural reliance on imports, where depreciated currencies increase import costs, fuelling domestic inflation and further widening the gap between exchange rates and PPP-aligned values (Fadia et al., 2020; Rojid & Rojid, 2024). Additionally, the speculative behaviour of investors during financial crises exacerbates exchange rate volatility, as market expectations diverge from fundamental economic indicators because many SSA economies depend heavily on commodity exports, and financial stress in global markets often depresses commodity prices, weakening SSA currencies and straining their ability to realign with PPP (Asuquo, 2021). Furthermore, weak financial systems, limited forex reserves, and constrained monetary policies in the region amplify this volatility, making it difficult to stabilize currencies amid financial stress (Asuquo, 2021; Sohag et al., 2023).

Financial stress can amplify exchange rate volatility across different economies with the implications shaped through PPP advocacy. For instance, in developed economies, exchange rates generally align closely with PPP due to stable economic fundamentals cum integrated financial markets in financial calm periods. However, during financial stress, deviations from PPP occur as safe-haven currencies appreciate disproportionately, driven by capital inflows (Adam et al., 2018). Also, Bordo and Flandreau (2001) argued that the U.S. dollar and Swiss franc consistently overvalued relative to their PPP benchmarks during global crises, reflecting their perceived stability. For emerging-market economies, exchange rate volatility is more pronounced under financial stress due to weaker economic fundamentals and higher sensitivity to capital flows (Rogach & Dziuba, 2017), as deviations from PPP are often larger and more persistent due to external shocks, such as declining commodity prices or capital flight. The PPP deviations may exacerbate inflationary pressures, particularly when the local currency depreciates sharply. According to Ramos (2016), emerging markets economies have experienced significant misalignment from PPP during periods of global financial stress, reflecting their vulnerability. For frontier economies, adherence to PPP is generally weak due to underdeveloped financial systems and significant structural inefficiencies. Financial stress in these markets often leads to extreme exchange rate fluctuations, reflecting speculative

pressures and limited foreign exchange reserves (Delvaux, 2024). The lack of market depth and external debt reliance exacerbate these effects. According to Rogach and Dziuba (2017), smaller African economies frequently experience prolonged periods of misaligned exchange rates under stress, far from PPP estimates, as highlighted in their analyses of frontier market risks.

2.2 Financial Stress

The concern surrounding financial crises and market instability is not new. Historical contributors like Fisher (1933), Keynes (1936) and Schumpeter (1939) provide substantial insights into understanding and addressing financial crises and economic downturns. Scholars have presented various definitions of financial stress. For instance, Abdymomunov (2013) describes financial stress as a state in which market participants experience heightened uncertainty, leading to a re-evaluation of asset values and economic activities. Notwithstanding the varying definitions and a lack of consensus on the variables to be considered, there is expected to be a strong correlation among the indexes because they use similar variables (see Kliesen et al., 2012).

There are divergent views on the primary sources of financial stress. Some studies state that psychological factors, such as panic, are a major trigger of financial crises (Akerlof & Shiller, 2009; Kindleberger, 1978; Minsky, 1986). Kindleberger (1978) argues further that those periods of economic euphoria, followed by panic and abrupt market downturns, are recurring patterns in financial history. However, there exists a school of thought that financial crises are consequent on poor or weak fundamentals like GDP, inflation, deposit rate, and even bank-specific variables – such as leverage, asset risk, and liquidity (Calomiris & Mason, 2003; Demirguc-Kunt & Detragiache, 1998; Friedman & Schwartz, 1963; Gorton, 1988; Martinez-Peria & Schmukler, 2001;).

According to Goldstein (2012), there exists a connection between fundamentals and crises as evidenced by various studies. However, these findings do not contradict the panic hypothesis. Literature suggests that fundamentals have the potential to induce panic, and subsequently, panic exacerbates the impact of fundamentals on the economy. Consequently, it can be argued that the fundamental-based approach and the panic-based approach are not contradictory; rather, they complement each other in understanding the dynamics of economic crises. Several factors contribute to financial stress in emerging markets. These factors include the influence

of financial turmoil in advanced economies by way of contagion; common global economic factors such as a rise in commodity prices, and global inflation; and country-specific factors which may include various macroeconomic and financial variables (Balakrishnan et al., 2011; Tumala et. al, 2021).

2.2.2 Financial stress and exchange rate volatility

Some literature has examined the connection between financial stress and various macroeconomic variables, while others have scrutinized the connection between financial stress and economic activity in individual countries (see Zabavnik & Verbic, 2021). The impact of financial stress on exchange rate volatility, especially in developing and emerging economies, is of great importance. Empirical evidence suggests a bi-directional and predictive causality between exchange rate volatility and financial stress (Tiwary et al., 2022). It is also noted that the fluctuations in exchange rates become more sporadic during financial crises, with this phenomenon more obvious in developing economies (Coudert, 2011; Tiwary et al., 2022).

However, the strength of the financial system plays a fundamental role in determining the extent and diffusion of stress, which subsequently leads to fluctuations in exchange rates. The intensity of the financial crisis, the sophistication of the financial markets, and global economic activity are factors that exacerbate exchange rate volatility during periods of financial stress (Gramlich et al., 2017; Wu et al., 2022).

2.3 Financial System in Sub-Saharan Africa

The evolution of the financial markets and the development of financial infrastructure in Sub-Saharan Africa impact the way financial stress affects the exchange rate volatility. The advancement of financial markets among economies is however hindered by macroeconomic risk, inflation volatility and output growth volatility within the region (Abaidoo &Agyapong, 2023). The interdependence of trade, the flow of capital, debts, and the provision of financial assistance from developed economies which include the United States, the Eurozone, and China to Sub-Saharan Africa has resulted in the exposure of the region to financial strain stemming from these larger economies (Tumala et. al, 2021). For instance, even after several nations have relaxed the connection between their currencies and the United States dollar, the United States economy continues to exert a significant influence on the impact of financial crises on developing economies (Coudert et. al, 2011).

It is therefore improbable that the exchange rate volatility in Sub-Saharan African nations would be independent from the activities of financial markets of more advanced economies. This further motivates examining the relationship between financial stress and exchange rate volatility in Sub-Saharan Africa.

2.4 Financial contagion

Events such as the 1995 Mexican crisis, the 1997 Asian financial crisis, the 1998 Russian financial crisis, the Global Financial Crisis in 2007-2009, and the more recent European sovereign debt crisis, further highlight the contagious nature of financial crises. This has reignited discussions on interdependence and vulnerabilities within the financial system, bringing the phenomenon of contagion to the forefront once again. Forbes (2012) highlights trade, banks and financial institutions, portfolio investors, and wake-up calls as channels through which contagion operates. The wake-up call contagion, as introduced by Goldstein (1998), involves a crisis in one region prompting investors to reassess other regions, potentially leading to a cascading spread of financial distress. The global financial crisis of 2007-09 vividly demonstrated the impact of contagion, starting as a crisis in the US domestic market before becoming a global challenge.

Despite the acknowledgement of systemic risks and contagion, controversy exists. Schwartz (1998) critiques the contagion hypotheses, arguing that only economies with inherent vulnerabilities are susceptible. Camera and Gioffré (2024) added that these risks are prevalent in economies characterized by weak fundamentals, such that even shocks which are limited to a small subset of the economy can diffuse speedily through the entire economy. Forbes and Rigobon (2002) showed that the correlation is dependent on the volatility of the market. It was observed that there was hardly any rise in the correlation coefficients that were not subject to any conditions, thus indicating the absence of contagion during the crises under review. Rather than financial contagion, Forbes and Rigobon (2002) suggested the term "market interdependence" as an alternative perspective.

3 Data and Methodology

3.1 Data

This is a brief discussion on the compiled panel dataset on the Financial Stress Index (FSI) and exchange rate of sub-Saharan African countries. The FSI is constructed using the newly developed methodology of Hites et al.(2023). According to the authors, the Financial Stress

Index (FSI) is computed by looking for wordings that indicate increased frictions in credit provision, reduced availability of credit, and increases in intermediation costs in the Economist Intelligence Unit (EIU) country reports. Specifically, first look for paragraphs containing two sets of keywords: (i) credit, financial, bank, lend, and fund; (ii) crisis, crunch, squeeze, bailout, rescue; tight; contract; restrict; and reluctant. To exclude false positives, identified paragraphs were later read for narratives of financial distress, and the frequency of keywords identified with financial distress (the second set of keywords) was determined. The indices are normalized by the total number of words and standardized to aid their comparability across countries, eliminate ideological bias, and improve their accuracy and consistency. The higher the number, the higher the financial stress, and vice versa. Economist Intelligence Unit (EIU)-based FSI is considered paramount to its alternatives, OECD Economic Outlook reports and IMF Article IV reports, due to its high frequency of publication, its availability over an extended time period, and most importantly, it is only index that covers underdeveloped and developing nations.

The 'Exchange Rate' data is computed for each country using the US dollar ($) as the reference currency. Based on the availability of financial stress data, only data from 22 sub-Saharan African countries is compiled. The countries are as follows: Benin, Burkina Faso, Cameroon, Chad, the Central African Republic, the Democratic Republic of the Congo, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Kenya, Liberia, Mali, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Tanzania, Togo, Uganda, and Zambia. Exchange rate data is extracted from the International Financial Statistics (IFS) of the International Monetary Fund (IMF). The compiled dataset is quarterly from 1967 to 2018.

3.2 Methodology

Two variants of the model are considered – a single-factor model where FSI is the only explanatory and extension of the first variant with the inclusion of oil price (a good proxy for global factor). Empirically, a strong link has been established between financial stress and exchange rate volatility (see Apostolakis & Papadopoulos, 2015; Bajo-Rubio et al., 2020; Coudert et al., 2011) also we estimate other variants of the extended model where the oil price is introduced as a control variable in the model (see, for example, Das et al., 2022; Donkor et al., 2022: Jawadi et al., 2016; Nazlioglu et al., 2015; Siddiqui et al., 2023) whose impact on exchange rate volatility has been empirically validated in the literature. Hence, a predictive model for exchange rate volatility accommodating any inherent heterogeneity and unobserved

common factors among the cross-sections in addition to the predictor series is employed and constructed validating the nexus among the variables (see Chudik & Pesaran, 2015; Delgado & McCloud, 2017; Salisu & Shaik, 2022; Salisu & Vo, 2020; Wang et al., 2023; Westerlund et al., 2017):

$$excv_{it} = \alpha_i + \sum_{1}^{4} \delta_{ij} fsi_{i,t-j} + \varepsilon_{it} \tag{1}$$

$$\begin{aligned} &\varepsilon_{it} = \lambda_i c_t + \mu_{it} \\ &i = 1,2,.....N; \quad t=1,2,...T \end{aligned} \tag{2}$$

Where $excv_{it}$ represents exchange rate volatility computed using the realised volatility as it captures the fluctuations in the exchange rate for the country i at period t; fsi is the financial stress index as explained earlier; α_i *and* δ_i denotes the heterogenous intercept and slope coefficients, respectively and they vary across the SSA countries; ε_{it} represents the composite residual term made up of the heterogenous factor loading (λ_i) accompanied with an unobserved common factor loading (c_t) and the error term (μ_{it}). Furthermore, for predictability heterogeneity, we incorporate unobserved common factors for the exchange rate volatility, while for FS predictability, we assume four lags given the 4-quarters data frequency where exchange rate volatility is expected to exhibit quarter-of-the-year effect as well as the need to capture more dynamics in the estimation process (see Salisu & Shaik, 2022; Salisu & Akanni, 2020; Salisu & Vo, 2020). Thus, the hedging potential of the SSA financial markets against risks associated with exchange rate volatility is estimated and evaluated via the Wald test for joint significance $\sum_{j=1}^{4} \delta = 0$, as these countries' exchange rates are likely to at least have some currency appreciation, on average, during the financial stress (tranquillity) periods, if $\sum_{j=1}^{4} \delta_j \geq 0op$; hence, exchange rate volatility keeps fluctuation on the adversely to the tune of the financial stress, thereby making the SSA economies vulnerable to economic distortion. Furthermore, having stated the single factor model with the FSI as the main predictor (see equation (1)), it is essential to express the second variant which includes oil price thus:

$$excv_{it} = \alpha_i + \sum_{1}^{4} \delta_{ij} fsi_{i,t-j} + \vartheta_i roil_{it} + \varepsilon_{it} \tag{3}$$

Where $roil$ is the log return of oil price using Brent crude oil price reflecting movements in global oil prices. The benchmark model is the historical average or constant return model

$\left[excv_{it} = \alpha + \varepsilon_{it}; t = 1,2,3,4,.....,T \; i = 1,2,3,4,....,N\right]$ and is described as the restricted model (see Salisu & Shaik, 2022), while the unrestricted model is the one that includes the FSI series (see equations (1) and (2)).

4 Results and Discussion

4.1 Summary statistics of financial stress and exchange rate volatility

The summary statistics in Table 1 give some information about the background of the data for the Financial Stress Index and Exchange Rate of the 22 countries with an available dataset in Sub-Saharan Africa. There are 208 observations for each country and 4576 for the pooled dataset. Among the 22 countries, 10 countries' financial stress is above the pooled financial stress on average (0.0096). Cameroon's (0.0296), Liberia's (0.0189), Nigeria's (0.0179), Cote d'Ivoire's (0.0174), and Togo's (0.0135) financial stress may be considered extreme. The standard deviation provides further information about the dispersion of the variable. The level of dispersion for the variable is as low as 0.0156, with a value of 8.2105 for the coefficient of variation, suggesting a possible presence of an outlier in the data composition. In terms of financial stress volatility, six countries' financial stress is more volatile than the pooled financial stress of sub-Saharan African countries (7.3229) on average. While Tanzania's (14.1667) and Liberia's (11.7302) financial stress volatility may be considered extremely above the mean of pooled financial stress, that of Burkina Faso (9.0000), Zambia (8.2105), Mali (7.9014), and Rwanda (7.7234) may be considered fair.

In terms of exchange rate, 11 countries had a relatively equal mean exchange rate (411.2580) within the period of study. Also, Uganda and Zambia have the same mean value of 2.2746 for the series. Out of the 22 countries, 13 countries' exchange rates are above the pooled exchange rate (239.9295) on average. Congo's exchange rate (269.1006) is the closest to the pooled exchange rate of all the countries on average. The remaining nine countries are extremely below the pooled exchange rate on average. The level of dispersion for the variable as expressed by its standard deviation is as low as 0.5397, with a corresponding value of 0.523 for the coefficient of variation, suggesting a possible absence of an outlier in the data composition.

Table 1: Summary statistics of financial stress and exchange rate volatility

		Financial Stress Index			Exchange Rate		
SN	**Series/Countries**	**Mean**	**Std. Dev.**	**CoV**	**Mean**	**Std. Dev**	**CoV**
	Pooled Data	0.0096	0.0703	7.3229	239.9295	241.2918	1.0057

1	Benin	0.0095	0.0503	5.2947	411.258	152.7439	0.3714
2	Burkina Faso	0.002	0.018	9	411.2579	152.7439	0.3714
3	Cameroun	0.0296	0.0858	2.8986	411.258	152.7439	0.3714
4	Chad	0.0049	0.0316	6.449	411.258	152.7439	0.3714
5	Congo DR.	0.0077	0.0549	7.1299	269.1006	430.6311	1.6003
6	Republic of Congo	0.0107	0.0469	4.3832	411.2579	152.7439	0.3714
7	Cote d'Ivoire	0.0174	0.0662	3.8046	411.2579	152.7439	0.3714
8	Ethiopia	0.0031	0.0201	6.4839	7.2126	6.773	0.9391
9	Gabon	0.0025	0.0177	7.08	411.2579	152.7439	0.3714
10	Ghana	0.007	0.0415	5.9286	0.7175	1.2059	1.6807
11	Kenya	0.0113	0.0494	4.3717	44.6774	34.3333	0.7685
12	Liberia	0.0189	0.2217	11.7302	54.6215	21.598	0.3954
13	Mali	0.0071	0.0561	7.9014	411.2579	152.7439	0.3714
14	Niger	0.0113	0.0572	5.0619	411.2579	152.7439	0.3714
15	Nigeria	0.0179	0.0832	4.648	65.5557	84.7495	1.2928
16	Rwanda	0.0094	0.0726	7.7234	305.5321	250.9437	0.8213
17	Senegal	0.0066	0.0406	6.1515	411.2579	152.7439	0.3714
18	Sierra Leone	0.0075	0.047	6.2667	1.6134	2.1081	1.3066
19	Tanzania	0.0012	0.017	14.1667	411.258	152.7439	0.3714
20	Togo	0.0135	0.089	6.5926	1.0319	0.5397	0.523
21	Uganda	0.0098	0.0496	5.0612	2.2746	3.0453	1.3388
22	Zambia	0.0019	0.0156	8.2105	2.2746	3.0453	1.3388

Source: Authors' work (2024)

4.3 FS-exchange rate volatility in SSA

The statistically significant and positive coefficients for financial stress (FS) at both 5% and 10% levels across different lags confirm a strong and persistent relationship between financial stress and exchange rate volatility. The cumulative impact, as indicated by increasing z-statistics and F-statistics, highlights the prolonged destabilizing effects of financial instability on currency markets in Sub-Saharan Africa (SSA). In the immediate past quarter (lag 1), financial stress resulted in immediate currency market disruptions, driven by capital flight and speculative activities, thereby leading to an increase in exchange rate volatility, connoting domestic currency depreciation. These dynamics are exacerbated by structural challenges, such as weak financial markets and over-reliance on external financing, leading to pronounced depreciation of local currencies (see Amit & Kafy, 2024; Braun & Hübner, 2018; Nandipati, 2021). The persistent impact when evaluating two previous quarters suggested that financial stress has lingering effects on exchange rates due to SSA's limited capacity for rapid recovery, constrained monetary policy options, and shallow foreign exchange reserves. This persistent volatility hampers economic activity by raising transaction costs, increasing inflation through import prices, and discouraging investment, particularly in economies heavily reliant on stable

currency values. This finding aligns with the purchasing power parity theory which states that during periods of financial stress, capital outflows and speculative pressures cause exchange rates to deviate significantly from their equilibrium levels, often overshooting in the short term. The prolonged volatility at lag 2 above further indicates that these deviations persist, preventing currencies from returning to their equilibrium value. Empirically, this finding agrees with the findings of Tiwary et al. (2022) and Coudert et. al. (2011).

Table 4: Estimation output

Panel A: Main Analysis								
	Lag length order							
	1		2		3		4	
FS	18.606[a] **	18.492[a] **	29.322[a]*	29.409[b]*	35.044[b]	35.892[b]	45.658[b]	46.600[b]*
roil		-0.037**		-0.036**		-0.037**		-0.035**
Panel B: Robustness Check								
	1		2		3		4	
	OECD -Full Sample							
FS	31.050[a]	29.486[a]	30.159[b]	29.038[b]	23.798[b]	22.831[b]	22.859[b]	21.264[b]
roil		-0.306***		-0.311***		-0.312***		-0.312***
	OECD-Advanced Economies							
FS	16.392[a]	15.489[a]	20.028[b]	19.594[b]	20.772[b]	20.327[b]	21.540[b]	20.568[b]
roil		-0.092**		-0.098***		-0.098***		-0.097**
	OECD-Emerging Markets							
FS	92.613[a]	88.270[a]	72.661[b]	68.707[b]	36.508[b]	33.344[b]	28.399[b]	24.186[b]
roil		-1.207***		-1.207**		-1.208***		-1.215***

Source: Authors' work (2024)

Note: [a] we use the z-statistics of the FS coefficient to determine the significance for lag order one. [b] we use the F-statistics by summing all the FS lags coefficient to determine the significance for lag length above order one. roil is the oil stock returns value serving as the control variable in the model and FS is the financial stress. ** & * imply significance at the 5% and 10% levels, respectively

The coefficients for oil price (roil) are consistently negative and significant at both 5% and 10% levels. This indicates that oil stock returns have a stabilizing effect on exchange rate volatility. By implication, at lag 1, oil stock returns represent immediate market reactions to oil price changes, such as trade balance improvements or investor sentiment shifts, which immediately dampen volatility. Moving to higher lags, the negative relationship reflects more prolonged economic adjustments, such as the accumulation of foreign reserves for oil exporters or reduced import costs for oil importers, both of which stabilize the currency further. This finding agreed with the PPP theory which stated that in the short term (lag 1), favourable oil stock returns mitigate deviations from PPP by curbing immediate inflationary pressures for importers or strengthening currencies for exporters, ensuring that relative prices across countries adjust more predictably. Over longer lags, the persistence of the negative relationship suggested a gradual correction of exchange rate misalignments driven by oil-related

macroeconomic improvements, such as balanced trade accounts or reduced external debt pressures. This delayed adjustment reinforces the idea that oil prices are a key determinant of exchange rate behaviour in SSA, directly influencing how closely exchange rates track PPP over time.

4.5 Additional Analysis: FS-exchange rate volatility in OECD

Further to the above analysis, and beyond limiting the estimation of the financial stress-exchange rate volatility nexus in sub-Saharan Africa, we further validate this nexus by subjecting our analysis to a more vibrant and financial stress minimal/less economic regions using the OECD region, and even after testing for the entire sample, we further subject our analysis by disaggregating the OECD region into the Advanced and Emerging-market subsamples to see the validity or otherwise of the PPP establishment and compare these subsamples exposition to what was obtained with the SSA region. The study findings reveal that financial stress has a positive but statistically insignificant relationship with exchange rate volatility in OECD countries, implying that it is not a primary driver of currency fluctuations in OECD countries. This indicates that other macroeconomic variables, such as interest rate differentials, trade balances, or inflation expectations, play a more dominant role in driving exchange rate fluctuations. The study's results align with PPP theory, indicating that financial stress, being an insignificant contributor to volatility, does not systematically disrupt the alignment of exchange rates with PPP in either advanced or emerging markets. In advanced OECD economies, robust financial systems are characterized by well-regulated banking sectors, diversified capital markets, and strong institutional frameworks, which enhance economic resilience during periods of financial stress. Proactive monetary policies, such as interest rate adjustments, quantitative easing, or the use of foreign exchange reserves, enable central banks to stabilize currency markets by countering the impact of financial instability. For example, during financial crises, advanced economies can attract "safe-haven" investments, further mitigating exchange rate volatility. In contrast, emerging OECD markets often lack these stabilizing mechanisms and are more susceptible to external shocks, such as sudden shifts in global capital flows or changes in investor risk sentiment. These markets are typically more dependent on foreign investments, which means that global factors like U.S. Federal Reserve policy or geopolitical tensions can overshadow the domestic effects of financial stress, leading to heightened exchange rate volatility independent of internal economic conditions. Thus, the structural and institutional differences between advanced and emerging markets significantly influence how financial stress interacts with exchange rate dynamics.

The negative coefficients for roil across all samples underscore a consistent inverse relationship between oil stock returns and exchange rate volatility, meaning higher oil stock returns are associated with reduced exchange rate fluctuations. This highlights the stabilizing influence of oil market performance on currency markets. For the full sample, the moderate magnitude (-0.31) reflects a balanced yet notable global impact, suggesting that oil markets play a meaningful role in reducing overall exchange rate volatility. In advanced economies, the smaller coefficients (-0.09 to -0.098) indicate that their exchange rates are less sensitive to oil stock returns, likely due to diversified economies and robust financial systems that mitigate external shocks. Conversely, in emerging markets, the significantly larger coefficients (-1.207) reveal a heightened vulnerability, as exchange rate volatility in these economies is strongly influenced by oil stock returns, reflecting their heavy dependence on oil markets and limited economic diversification. This suggests that while oil market stability benefits global currency stability, its impact is more pronounced in less resilient and oil-dependent economies.

5 Conclusion and Policy Implications

The study's findings underscore the nuanced relationship between financial stress and exchange rate volatility across different economic contexts. In sub-Saharan Africa, financial stress appears to amplify exchange rate volatility, aligning with the purchasing power parity theory. This theory suggests that exchange rates adjust to equalize the purchasing power of currencies, a process more pronounced in regions with less mature financial markets and heightened external vulnerabilities. In contrast, the robustness check conducted on OECD economies reveals that financial stress is not a principal factor driving currency fluctuations. This distinction likely reflects the structural differences between advanced and emerging markets within the OECD. Advanced economies typically exhibit stronger institutional frameworks and more liquid financial markets, enabling them to absorb financial shocks more effectively. Emerging markets within the OECD, though more susceptible to financial stress, benefit from relative integration into global markets, which may buffer volatility. Given these findings, policymakers in sub-Saharan Africa should prioritize financial system stability by enhancing regulatory oversight, diversifying economic structures, and bolstering reserves to cushion against external shocks. Additionally, fostering deeper regional financial integration could provide a collective buffer against volatility.

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