

Digitalization of the Money Market. How Does Digitalization and the Money Market Instruments Enhance Living Standards in South Africa?

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Abstract: Objective: The objective is to examine how digitalization and instruments of the money market can enhance living standards in South Africa from 1992 to 2024. **Prior Work:** South Africa has experienced improvements in the standards of living since its transition to democracy, however in the last decade improvements in the quality of life have been uneven. Inclusive financial systems and digitalization have played a role in the betterment of the citizens standard of living by providing banking services that are easily accessible. **Approach:** The autoregressive distributed lag bounds approach was utilised, including other econometric techniques. **Results:** The variables are stationary and cointegrated. Furthermore, showing that digitalization and some money market instruments positively influence living standards in the short and long term. **Implications:** This article highlights that digitalization acts as a catalyst for financial inclusion while simultaneously risking the widening of economic divides. Programs and measures that will promote innovation, financial inclusion and the development of the money market should be put in place and implemented. Monetary and fiscal measures, including research and development programs. **Value:** The study sheds light on the influence that digitalization and money market instruments have on South Africa's living standards.

Keywords: Digitalization; Gross Domestic Product per capita; Money market instruments; Mobile cellular subscriptions; Living standards

JEL Classification: E44, O33

1. Introduction

All governments deal with the issue of living standards in several ways, by ensuring that their citizens have good living conditions, as this is considered as a prerequisite for the overall growth and improvement of living standards within a nation, as highlighted by Gonos, Culkova, Tomkova, Rovnak and Chovanec (2025). According to Kgomo and Ratombo (2022), a good standard of living is not simply a creation of employment but can be compared to the effective use of various economic

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policy elements, such as the fiscal policy by the government, to distribute its economic activities. Furthermore, an increase in economic growth activities can be used to determine the optimum standard of living. To sustain or expand economic growth operations, there should be continuous investments that can optimize the standard of living within the country's context. However, rapid economic growth changes, such as digitalization and the money market, are having a serious effect on determining the standard of living.

South Africa has experienced improvements in the standards of living since its transition to democracy, however in the last decade improvements in the quality of life have been uneven. The overwhelming consequences surrounding the standard of living are apparent, especially in developing countries, where digitalization and money market instruments are often adopted without protecting economic growth. Amidst the worldwide standard of living catastrophe, the digital economy and money market have risen extremely to influence many developing countries' economic growth and pose complex challenges to the living standard, including African countries, and around the globe (Mpofu & Mhlanga, 2022). It is worthwhile to note that the general role of economic development is centred on the upliftment of the living standards to ensure the freedom of the citizens by promoting the desired quality of human lives, as alluded by Kgomo and Ncanywa (2025).

The modern society has become a space to display an essential part of digitalization, and markets as game changers of the financial industry by ensuring that everywhere the speed of information dissemination overtakes the established traditional methods in the perception and performance of proficient economic activities, particularly the living standard (Kokkinou, Korres & Dionysopoulou, 2018; Sedova, Arkhipova, Melnikova & Aleshina, 2022). Gribanov and Shatrov (2019) refer to digitalization as a country's influential factor, scope, and system, which is linked to the economic and social development of the country's territorial creation through new and additional value of export. Furthermore, it brings about long-term improvements in organizations' business activities by focusing on corporate culture, management systems, and typical variances associated with economic growth. Apart from digitalization, financial markets provide positive records that are useful in developing economies to raise and maintain the economy's level of social stability, and to facilitate economic development from the threshold (Kgomo & Ncanywa, 2025).

So far, numerous researchers, such as Mpofu and Mhlanga (2022), Zharikov (2023), and Kere (2024), to name a few, have opted for the digitalization of banks or money, or currencies, on economic growth. On the other hand, Kolinets (2023); Kgomo and Ncanywa (2025); Zeng, Chen, Wang and Zou (2025), chose to account for the international financial markets of the future, financial economic development agenda, education investment, social security, and household financial market participation. Having established the listed studies, the question is not answered as to how the optimum living standards will be sustained amid other existing digital transformations, economic challenges, and uncertainties, such as development of mobile banking applications, electricity supply calamity, cybercrime, and racial intolerance. The significance and novelty of this article is to investigate the role of digitalization and the money market instruments of South Africa regarding a decent living standard.

The autoregressive distributed lag (ARDL) was applied to time series data spanning from 1992 to 2024 to address the concern surrounding the living standard of South Africans. Hence, this article is planned as follows: section 2, the literature review is presented, followed by the methods under section 3. Section 4 presents the analysis of empirical results from EViews 13 software. Lastly, section 5 provides a conclusion and recommendations for policy directions and future research.

2. Literature Review

This section provides the theoretical and empirical literature review on the link between digitalization, money market instruments, and living standards.

2.1. Theoretical Literature

2.1.1. Dependency Theory

The study adopted the dependency theory, which was introduced by Raúl Prebisch in the early 1950s and augmented by Frank Andre Gunder in 1967. This theory maintains that developing nations suffer from structural dependence on their development stage, as external funding usually hinders their economic growth, sustainability, and intellectual development. Furthermore, Gunder (1969) and Rostow (1959) theorized that it is coherent that nations move linearly through several successive stages of growth. The dependency theorists were also used for the groundwork to analyze the structure of international division of labor and systems, and economic aspects such as commodity chains, and global cities research agendas (Sassen, 1991). According to Prebisch (1950), Knuttson (2009), and Gessi (2024), the dependency theory naturally holds that a higher standard of living is achieved through targeted policy and appropriate intervention. Lastly, the dependency theorists used it to contend that developed countries should continue to channel their development and the underdevelopment of others. In this way, developing nations should follow development paths that are provided in line with their unique needs, as also underlined by Gessi (2024).

Due to the automatic switch from traditional methods to advanced digital platforms, the financial institutions are bound to provide numerous electronic services through mixed digital business platforms. Numerous emerging economies, including South Africa, still cannot afford to offer specific digital technology capability due to over-dependence on external financial systems. South Africa is capable of offering normal/ general digital money market technology capability, similar to or common to any emerging economy setting. The advent of digital administration has similarly expanded South Africa's dependency on external financial systems through foreign direct investment (FDI) inflows. Digitalization provides a relevant, new mode of service and condition of operations to the emerging economies, such as South Africa, by increasing the level of dependence on external financial systems, while also increasing money market operations. However, South Africa still requires a comprehensive digital technology competence to harness the successful digital transformation, particularly from the external financial service providers, to reduce dependency, government debt while achieving substantial economic growth. Moreover, external financial service providers are closely tied to the existing digital technology capabilities and apparent developments in emerging economies.

According to Belitski, Guenther, Kritikos, and Thurik (2022), and Msomi and Kandolo (2023), access to funds has a significant impact on the maintainability of a firm, while understanding of digital platforms is necessary to acquire funding from external financial service providers, to boost the speed, productivity, and openness of connections geared toward serving the disadvantaged. South Africa's digitalization of its money market depends on external financial systems to finance economic growth, to alleviate poverty, and create employment opportunities. Hence, South Africa's digital money markets are unable to reduce dependency when enabling local financial system inclusion, particularly through mobile banking, and prolong reliance on global tech infrastructures.

2.1.2. Neoclassical Growth Theory

Apart from the dependency theory, the neoclassical growth theory was adopted, it was also extended by Solow during 1956. In this study, digitalization of the money market is framed as technological advancement, linked to the neoclassical growth theory. The neoclassical growth theory assumes that the production function is exogenous, and this relationship is more consistent with the genuineness of the developed countries than the developing ones as the shares of factor inputs in final output may vary more subtly over time than in the former, final output. Reis, Amorim, Melao, Cohen and Rodrigues (2020), Jia, Collins and Liu (2023), and Gradillas and Thomas (2025) presented the neoclassical economics perspective by stressing that an increase in input factors can be used to refine the level of technology.

2.1.3. Financial Dualism Theory

The theoretical leaning of this study was also extended by adding the Financial Dualism Theory (FDT), as also promoted by Myint (1971), and Igoni, Onwumere and Amaewhule (2020). The FDT considers the organized and unorganized coexistence of money markets. The notion behind the FDT is that monetary policy is used to generate the corresponding and common sensitivity factors in the money market. Furthermore, it is worthwhile to note that the application of both the regulatory and non-regulatory money market aspects disturb the routine of the monetary policy. South Africa can consider adopting the FDT to improve the focus on organized and unorganized coexistence of money markets, particularly through digitalization processes, to achieve various changes more subtly over time.

2.2. Empirical Literature

The empirical literature reveals the digitalization and the money market relationship on living standards.

Sedova et al. (2022) conducted a study on the digitalization of the economy and the living standards of the population in Russian regions. The study reveals that digitalization strongly affects living standards, resulting in unsatisfactory access to modern resources and benefits. Hence, the poverty level and salary maintenance ratio rely on satisfactory levels of digitalization to cover countries' various markets, which affects the population's living standards. According to Ibragimov, Mukhametzyanov, Borulko, Dzhancharova and Bovina (2023), Russia is still behind in the development of digital technologies for use in the agricultural sector and their practical application. The study revealed that the Russian government and authorized ministries launched the Digital Economy of the Russian Federation project to improve living conditions in rural areas by focusing on agricultural. Rajagukguk, Purba and Budiono (2021) studied economic factors of mobile cellular subscription growth, focusing on 260 countries from 2005 to 2017. The fixed effects model was conducted. The number of mobile cellular subscription was the dependent variable, and the independent variables utilized as proxies for economic development indicators were automated teller machines (ATMs) and access to electricity. It was found that access to electricity (% of population), gross domestic product (GDP) per capita and ATMs (per 100,000 adults) positively affected mobile cellular subscription and the probability values (p-value) were found to be significant.

Babarinde, Popoola, Abdulmajeed and Mohammed (2021) looked at how the money market affected Nigeria's economy from 1981 to 2018. The study conducted the Fully Modified Ordinary Least

Squares Method (FMOLS) to analyse the impact of the money market on economic growth. The money market was measured by money market instruments, namely bankers' acceptance, certificate of deposit, commercial papers, treasury bills and treasury certificates and economic growth proxied by GDP. The empirical findings revealed that in the long run the money market instruments had a positive and significant effect on GDP, excluding treasury bills. Treasury bills had an adverse and insignificant effect on GDP. The study used the pairwise Granger causality test and found unidirectional relations from bankers' acceptance to GDP and from commercial papers to GDP, and a bidirectional relationship between treasury bills and GDP. Furthermore, the money market instruments, and GDP are cointegrated and differenced once for stationarity. Similarly, Akintola and Olurin (2023) used time series analyses to examine the relationship between the money market instruments and economic growth (GDP) in Nigeria starting from 1993 to 2022. The Ordinary Least Square (OLS) of multiple regression analysis was employed. From the regression analysis results, treasury bills were found to be the significant factor that influenced changes in Nigeria's GDP, unlike certificate of deposit and commercial papers. In the same vein, Obi (2021) investigated relationship between Nigeria's money market instruments and economic growth (real GDP) from 1981 to 2019. The study adopted econometric techniques such as unit-root and Johansen cointegration tests. The techniques conducted showed that all variables were integrated of order one and cointegrated. The empirical findings further showed that treasury bills, certificate of deposit, commercial paper and bankers' acceptance do have a positive and significant influence on real GDP.

Loaba, Traoré, Compaoré and Ouédraogo (2024) conducted a study in Burkina Faso using a sample of 9001 females, which was obtained from the living standard survey of the World Bank database. The authors reported that digital finance improves women's empowerment and increases their chances of labour market participation. The study suggested that Burkina Faso policies should be aligned to promote digital finance by considering women's inclusion in various services and providing modified products and services that will enhance women's socio-economic conditions. Digitalization, along with mobile money, to solve bank account ownership challenges experienced by adults in developing countries, especially in African countries. The above statement corresponds to Degryse (2016), who discloses that the digitalization of the economy is useful to promote growth, welfare, and improve the success of public policies. According to Kgomo and Ncanywa (2025), the money market, stock market, and foreign exchange market negatively influence the economic development index of the selected SADC countries such as Tanzania, Mauritius, South Africa, Namibia, and Botswana, in the long run. The study applied panel econometric techniques to cover the period from 2007 to 2021.

A study was conducted in OECD countries to analyze the standard of living considering economic performance, covering the period from 2005 to 2019, by Gonos et al. (2025). The study revealed that the selected OECD countries' development of their economies grew properly if they monitored and vice versa. Additionally, Palkovic, Bendelova, Kosiciarova and Kadekova (2017) and Gonos et al. (2025) opined that the European Union countries are more diversified since they rank their economies in terms of the standard of living of the population and welfare situation in each country. Having recognized that, Vardanyan and Lewandowski (2018) conducted a study in the Eastern bloc of Europe, with former centrally planned economies, to reveal that the standard of living has a great positive impact on the economic and social life of the country.

In summary, the literature reviewed confirms some positive and negative linkages between digitalization and the money market on economic growth, with little emphasis on scholars such as Vardanyan and Lewandowski (2018), Loaba et al. (2024), and Gonos et al. (2025), who linked their

studies to the living standard. Yet the previously reviewed studies provide that their linkage or impact varies as digitalization and money market on living standard concepts were studied as individual concepts across countries and depending on the study period. Even so, some recent literature reviews revealed contradicting results, and further reveal that there is a dearth of literature that focuses directly on digitalization and the money market instruments on living standards, especially in the South African context, as the current study intends to contribute.

3. Methodology

The research methodology section provides details on the data sources, estimated regression model, and econometric methods to be conducted.

3.1. Data Source

The study used secondary time series data from the South African Reserve Bank (SARB) and the World Bank Development Indicators (WDI) database from 1992 to 2024 to achieve the research objective. The timeframe analysed captures the significant rise in digital transformation, access to mobile phones and internet in South Africa. The study period makes it possible to determine how such transformations and developments interact with socio-economic inequalities. In the study, living standards as the response variable will be measured by GDP per capita; the explanatory variables which include digitalization will be proxied by mobile cellular subscriptions (MCS) per 100 people and the money market instruments used are bankers' acceptance (BA), treasury bills (TB) and certificate of deposits (CD). Mobile cellular subscriptions can be used as a digital measure as it indicates extensive access to mobile based information and communication technologies (Rajagukguk et al., 2021). Money market instruments can serve as a barometer for a country's economic development by showing the short-term capital mobilization efficiency reflecting the financial system stability and liquidity.

3.2. Model Specification

The objective of the study is to determine the influence of digitalization and money market instruments on living standards. This implies that the living standards are a function of digitalization and money market instruments, which can also be expressed as follows:

$$GDP = f(MCS, BA, TB, CD) \quad (1)$$

The estimated logged regression model can be written as:

$$LGDP_t = \beta_0 + \beta_1 LMCS_t + \beta_2 LBA_t + \beta_3 LTB_t + \beta_4 LCD_t + \mu_t \quad (2)$$

Where: $LGDP$ denotes the logged GDP per capita, $LMCS$ the logged mobile cellular subscriptions, LBA the logged bankers' acceptance, LTB the logged treasury bills and LCD the logged certificate of deposits. β_0 is the intercept, β_1 to β_4 are the estimated parameters, μ the error term and t is the time trend.

3.3. Estimation Procedures

To investigate the influence and relationship between the variables, the descriptive statistic, correlation matrix, stationarity test, ARDL bounds test, casualty test, diagnostic, and stability tests were utilized.

3.3.1. Descriptive Statistic

Descriptive statistics are used to summarize a collection of observations (Shobande & Asongu, 2022; Yao, Wei & Bai, 2022). According to Salvatore (2021), descriptive statistics presents the most comprehensive information in the simplest manner. To eliminate the likelihood of an outlier in the data, the minimum and maximum statistics are utilized. It is required that the model is normally distributed, as suggested by the classical linear regression. The descriptive statistic further provides information about the kurtosis and skewness.

3.3.2. Correlation Matrix

The correlation matrix test is used to assess the probability of multicollinearity problem between the included variables in the study (Balogun & Talabi, 2024). Multicollinearity problem may occur when estimating correlation coefficients between factors. Ziberi and Miftari (2021) asserts that correlation analysis assesses the strength of the linear association between two variables.

3.3.3. Stationarity Test

The Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) stationarity tests were conducted to determine if the series under consideration has no unit root and is stationary. In the stationarity test the test-statistic value was compared with the critical value at the significance level to determine if the series is nonstationary or stationary. In the study the null hypothesis (H_0) is that there is a unit root, implying non-stationarity. While the alternative hypothesis (H_1) indicates that there is no unit root, and the series is stationary.

3.3.4. Autoregressive Distributed Lag (ARDL) Bounds Test

The ARDL approach was chosen and conducted to check the kind of effect digitalization and the money market instruments have on living standards in the short- and long-run. The ARDL approach further offers the bounds cointegration test results. Most cointegration techniques require that all variables in the model be integrated of the same order to produce valid results. However, the ARDL technique produces efficient and reliable results when dealing with a small or large sample size, whether the series is $I(0)$ or $I(1)$ or a combination of both (Alam, Li, Baig, Ghanem & Hanif, 2021). The ARDL bounds test makes use of the joint F-statistic, which is compared with the critical lower and upper bounds values, to determine whether or not there is cointegration. The error correction model (ECM) is also stated to be the base of the ARDL approach, especially for determining whether the series will converge back to equilibrium (Mohsin, Abbas, Zhang, Ikram & Iqbal, 2019).

3.3.5. Granger Causality Test

To test the direction of causality the Granger causality test approach is utilized to examine the causal relationship between the variables. The concept of causality between two or more time series variables was introduced by Granger (1969). According to the concept, it is stated that variable x Granger causes variable y , if the variable y can be better predicted using past values of both x and y , rather than just past values of y (Xiao, Karavias, Juodis, Sarafidis & Ditzen, 2023).

3.3.6. Diagnostic and Stability Tests

The Jarque-Bera normality approach was used to validate the normality assumptions. This technique is conducted for its asymptotic test that is specific to OLS and it also captures the skewness and kurtosis (Nkwede, 2020). The Breusch-Pagan-Godfrey and the Autoregressive Conditional Heteroskedasticity (ARCH) methods were conducted to check the presence of serial correlation and heteroskedasticity in the estimated model. The Ramsey regression equation specification error test (RESET) was included to determine if the model contains any specification errors. The cumulative of sum (CUSUM) and cumulative of sum squares (CUSUMQ) tests proposed by Brown, Durbin and Evans (1975), were conducted to assess the series' stability and robustness.

4. Findings and Discussion

This section presents and discusses the findings based on the numerous econometric tests conducted. The descriptive statistic results are presented first, followed by the correlation matrix, stationarity results, ARDL bounds test, causality and lastly the diagnostic and stability test results.

4.1. Descriptive Statistic Results

Table 1 presents the descriptive statistic results.

Table 1. Descriptive statistic

	LGDP	LMCS	LBA	LTB	LCD
Mean	4.855084	1.502592	4.025083	4.647541	4.252344
Median	4.875461	1.944668	3.994889	4.721365	4.281738
Maximum	4.904126	2.253668	4.448784	5.564322	4.788593
Minimum	4.787560	-1.523511	3.771073	3.307710	3.410946
Standard Deviation	0.042719	0.977908	0.168128	0.714653	0.335022
Skewness	-0.340312	-1.652456	0.686426	-0.373275	-0.534477
Kurtosis	1.427867	4.985987	2.972240	1.897949	3.009634
Jarque-Bera	4.035423	20.44155	2.592553	2.436300	1.571289
Probability	0.132959	0.000036	0.273549	0.295777	0.455826
Observations	33	33	33	33	33

Authors' Computation (2026)

In Table 1, GDP per capita has a mean of 4.86, mobile cellular subscriptions of 1.50, bankers' acceptance of 4.03, treasury bills of 4.65 and certificate of deposits of 4.25. The minimum and maximum values for GDP per capita are 4.79 and 4.90, mobile cellular subscriptions -1.52 and 2.25, bankers' acceptance 3.77 and 4.45, treasury bills of 3.31 and 5.56, and certificate of deposits 3.41 and 4.79 respectively. The results of Babarinde et al. (2021) also found treasury bills as having the highest maximum value among the other money market instruments. On the other hand, mobile cellular subscriptions have a higher standard of deviation of 0.977908, followed by treasury bills (0.714653), certificates of deposit (0.335022), bankers' acceptance (0.168128) and lastly GDP per capita (0.042719). Skewness results indicate that GDP per capita, mobile cellular subscriptions, treasury bills and certificates of deposit are negatively skewed, except bankers' acceptance. GDP per capita, bankers' acceptance and treasury bills have a kurtosis less than 3, implying the variables have a platykurtic distribution with thin tails and fewer extreme outliers compared to a normal distribution. Mobile cellular subscriptions have a kurtosis of 4.985987 that is significantly higher than 3, indicating

that the variable experiences extreme outlier values frequently and it has a leptokurtic distribution. The certificate of deposits kurtosis is 3.009634, slightly above 3 by 0.009634, and it is approximately normal.

4.2. Correlation Matrix Results

The correlation matrix results are shown in Table 2.

Table 2. Correlation matrix

	LGDP	LMCS	LBA	LTB	LCD
LGDP	1				
LMCS	0.373545	1			
LBA	0.422873	0.167531	1		
LTB	0.265080	0.093431	-0.045655	1	
LCD	0.195514	0.089501	-0.153653	0.179235	1

Authors' Computation (2026)

The correlation results in Table 2 show that GDP per capita is positively correlated with mobile cellular subscriptions, bankers' acceptance, treasury bills and certificate of deposits. It is evident from the findings that the variables are not highly correlated as the values are less than 0.7 the benchmark for detecting multicollinearity. It has been determined that there is no multicollinearity between the variables.

4.3. Stationarity Test Results

The stationarity results are presented in Table 3.

Table 3. Stationarity test

Variables	Model specification	Level, $I(0)$		First Difference, $I(1)$	
		ADF test statistic	PP test statistic	ADF test statistic	PP test statistic
LGDP	Intercept	-1.443296	-1.431905	-4.511432***	-4.514971***
	Trend and intercept	-0.509539	-0.672496	-4.805288***	-4.805288***
LMCS	Intercept	-10.01775***	-20.58884***		
	Trend and intercept	-4.543179***	-13.63712***		
LBA	Intercept	-2.169911	-2.325014	-3.890471***	-7.064014***
	Trend and intercept	-4.649253***	-4.499491**	-3.732140**	-6.269434***
LTB	Intercept	-2.047776	-1.977903	-3.189238**	-3.196396**
	Trend and intercept	-2.269524	-1.354775	-3.627453**	-3.335986*
LCD	Intercept	-2.799709*	-2.725528*	-4.936771***	-4.982114***
	Trend and intercept	-2.044006	-2.048293	-5.184181***	-5.189125***

*Note: * denotes rejection of the null hypothesis at 10%; ** at 5% and *** at 1% significance levels.*

Authors' Computation (2026)

The utilized stationarity tests show that GDP per capita and treasury bills are stationary after first difference at all testing procedures in Table 3. Mobile cellular subscriptions results indicates that it is integrated of order zero [$I(0)$], as it is found to have no unit root at levels. The other money market

instruments, bankers' acceptance, and certificate of deposits, had to be differenced as they were nonstationary at levels implying there was presence of unit root in some testing procedures. After differencing these two variables there was no unit root but indication of stationarity. This is supported by the study of Babarinde et al. (2021) and Obi (2021), who revealed that to attain stationarity, the money market instruments had to be differenced once. It can be concluded from the stationarity findings that some of the variables used in the model had to be differenced once. Thus, the variables are stationary and are $I(0)$ and $I(1)$, allowing the ARDL cointegration bounds test to be carried out.

4.4. ARDL Results

The ARDL bounds test results are provided first in Table 4; which shows whether there is cointegration. The stationarity and non-stationarity bounds can also be indicated by $I(0)$ and $I(1)$, that further represent the critical values of the lower- and upper bounds.

Table 4. ARDL bounds test results

Test Statistic				Value		
F-statistic				11.633513		

	10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
30	2.525	3.560	3.058	4.223	4.280	5.840
Asymptotic	2.200	3.090	2.560	3.490	3.290	4.370

Authors' Computation (2026)

The F-statistic is 11.633513, which is greater than the critical values of the lower bound $I(0)$ and upper bound $I(1)$ at all levels of significance. This implies that the variables are cointegrated as indicated in Table 4. The ARDL long run outcome is presented in Table 5.

Table 5. ARDL long run results

Variable	Coefficient	Std. Error	t-Statistic	P-value
LMCS	0.098342	0.018112	5.429748	0.0000
LBA	-0.020783	0.013981	-1.486571	0.1501
LTB	0.016825	0.007716	2.180650	0.0392
LCD	0.060167	0.008335	7.218580	0.0000
C	4.395575	0.067216	65.39514	0.0000

Authors Computations' (2026)

ARDL long run equation can be expressed as follows:

$$LGDP_t = 0.098342LMCS_t - 0.020783LBA_t + 0.016825LTB_t + 0.060167LCD_t \quad (3)$$

In equation 3 GDP per capita seems to be positively influenced by mobile cellular subscriptions, treasury bills, and certificate of deposits. The p-values of the variables (0.0000, 0.0392 and 0.0000) are less than 0.01 and 0.05 significance level, which indicates the significance of the long run relationship. The money market instruments raise living standards through macroeconomic transmission channels. Bankers' acceptance was found to have an adverse effect on GDP per capita, although the p-value of 0.1501 is insignificant. If mobile cellular subscriptions increase by 10%, GDP per capita will increase by 0.98%. When mobile phone adoption increases in South Africa, that leads to a statistically significant improvement in human development, welfare, or income (Ratombo & Mongale, 2024). This shows that improvements in digitalization does enhance standards of living in South Africa.

These findings are supported by the study of Loaba et al. (2024) and Degryse (2016), that digital transformation within an economy can enhance growth and promote its welfare. When treasury bills and certificate of deposits increase by 10%, GDP per capita is also expected to improve by 0.17% and 0.60%. A rise in money market instruments (treasury bills and certificate of deposits) corresponds with improvements in societal welfare and economic well-being overtime (Boutfssi, Zizi & Quamar, 2026). In the long run, bankers' acceptance and certificate of deposits were reported to be positive and significant contributors to GDP in the study of Babarinde et al. (2021). However, in this study treasury bills and certificate of deposits are the money market instruments found to contribute to the betterment of living standards in South Africa, unlike bankers' acceptance. The study of Obi (2021) and Akintola and Olurin (2023) found treasury bills to also have a significant effect on GDP.

The short run outcome and speed of adjustment (COINTEQ) coefficient are presented in Table 6.

Table 6. ARDL short-run results

Variable	Coefficient	Std. Error	t-Statistic	P-value
D(LMCS)	0.111923	0.024368	4.593062	0.0002
D(LBA)	-0.019564	0.014520	-1.347400	0.2009
D(LTB)	0.055210	0.020558	2.685574	0.0151
D(LCD)	0.031689	0.008789	3.605488	0.0020
COINTEQ	-0.941336	0.095752	-9.830954	0.0000

Authors' Computations (2026)

Mobile cellular subscriptions, treasury bills, and certificate of deposits influence on GDP per capita in the short run is similar to the long run results. It is evident from the short-run results in Table 6, that digitalization and some of the money market instruments are fundamental in enhancing living standards in South Africa. Money market instruments offer liquidity, funding and stability that is required for macroeconomic growth. While digitalization makes it possible for the average consumer to participate fully in the financial ecosystem. The speed of adjustment (-0.941336) has a p-value of 0.0000, implying that the series will converge back to equilibrium. It can be concluded from the ARDL results that the variables have a long-run cointegrating connection, indicating that they move together over time to rectify short-run disturbances.

4.5. Granger Causality Test Results

The pairwise Granger causality test is used to determine if the variables do influence each other, and if there is a unidirectional or bidirectional link among them.

Table 7. Pairwise Granger causality results

Null Hypothesis:	F-Statistic	P-value
LMCS → LGDP	2.98968	0.0944
LGDP → LMCS	0.68392	0.4150
LBA → LGDP	0.27762	0.6023
LGDP → LBA	2.78958	0.1056
LTB → LGDP	0.10840	0.7443
LGDP → LTB	4.19147	0.0498**
LCD → LGDP	2.74213	0.1085
LGDP → LCD	0.04081	0.8413
LBA → LMCS	0.05372	0.8183

LMCS → LBA	6.91267	0.0135**
LTB → LMCS	1.35562	0.2538
LMCS → LTB	0.77702	0.3853
LCD → LMCS	0.25032	0.6206
LMCS → LCD	0.05724	0.8126
LTB → LBA	9.91821	0.0038***
LBA → LTB	1.36291	0.2525
LCD → LBA	1.59287	0.2170
LBA → LCD	0.02408	0.8778
LCD → LTB	0.88317	0.3551
LTB → LCD	0.87218	0.3581

Observations: 32.

Note: ** denotes rejection of the null hypothesis at 5% and *** at 1% significance levels.

Authors' Computation (2026)

In Table 7, digitalization (mobile cellular subscriptions) and the money market instruments (bankers' acceptance and certificate of deposits) were found not to lead to changes in standards of living (GDP per capita), vice versa. Past values of treasury bills do not predict future changes in GDP per capita; however, past values of GDP per capita do statistically predict changes in the money market instrument (treasury bills) indicating a unidirectional association with a p-value of 0.0498. These findings are in contradiction with the causality results of Babarinde et al. (2021), where a unidirectional link was found from bankers' acceptance to GDP per capita; a bidirectional relationship between GDP per capita and treasury bills. Mobile cellular subscriptions do Granger cause bankers' acceptance, but bankers' acceptance does not Granger cause mobile cellular subscriptions. There is a unidirectional relationship, as any changes in mobile cellular subscriptions will affect bankers' acceptance. The null hypothesis that mobile cellular subscriptions does not Granger cause bankers' acceptance is rejected at 5% significance level. Treasury bills and mobile cellular subscriptions, including certificate of deposits and mobile cellular subscriptions do not Granger cause each other. Changes in treasury bills can predict future changes in bankers' acceptances, but changes in bankers' acceptances do not provide useful predictive information about future treasury bills. This shows a unidirectional association from treasury bills to bankers' acceptance. The null hypothesis that treasury bills does not Granger cause bankers' acceptance is rejected at 1% significance level. Changes in certificate of deposits will not have an impact on bankers' acceptance and treasury bills. The null hypothesis is thus not rejected, as it is evident that the p-values are above the 5% significance level.

4.6. Diagnostic and Stability Tests Results

The diagnostic tests were conducted to check if the model was normally distributed and did not exhibit serial correlation or heteroskedasticity issues.

Table 8. Diagnostic results

Test	P-value
Jarque-Bera normality test	0.918056
Breusch-Godfrey Serial Correlation LM Test	0.2866
Heteroskedasticity Test: ARCH	0.1236

Authors' Computation (2026)

The Jarque-Bera normality test null hypothesis is that the model is normally distributed. Table 8 shows that the series is normally distributed as the p-value of 0.92 is greater than 0.05 significance level. Furthermore, the kurtosis is 3.250155, which is greater than 3 indicating the data distribution is slightly leptokurtic. The skewness value is -0.140477, revealing that the data distribution has a long or stretched tail on the left side. For the serial correlation test, the null hypothesis is that there is no serial correlation present in the series. The p-value of 0.2866 exceeds 0.05, implying that there are no serial correlation problems. The heteroskedasticity ARCH test has a p-value of 0.1236 which is above 0.05 level of significance. Based on these results, it can be stated that the model is also free of heteroskedasticity problems.

The Ramsey Reset test results are presented in Table 9, where the null hypothesis is that the model is correctly specified, and alternative hypothesis that the model is misspecified.

Table 9. Ramsey Reset results

Test	P-value
Ramsey Reset test	0.6918

Authors' Computation (2026)

It is evident from the Ramsey Reset results in Table 9 that there is no specification error and no omitted variables as the p-value of 0.6918 is greater than 0.05 level of significance. In this case the null hypothesis is not rejected. The stability results are indicated by Figure 1 and 2, that shows that CUSUM and CUSUMQ outcome.

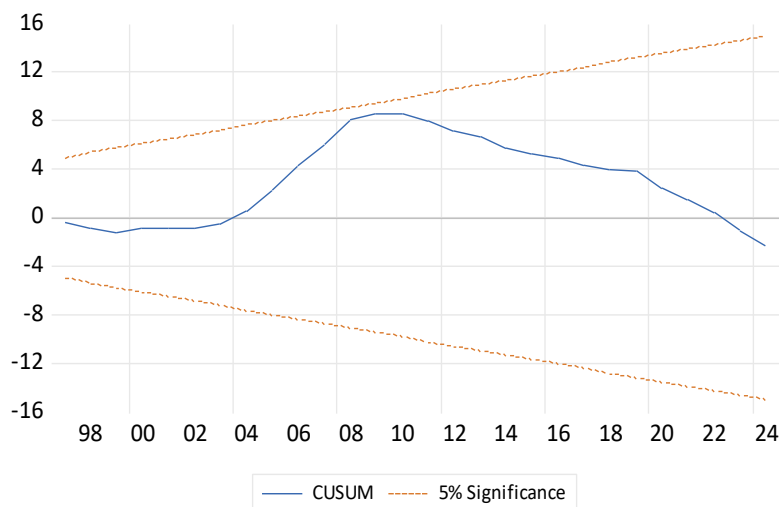


Figure 1. CUSUM

Authors' Computation (2026)



Figure 2. CUSUMQ

Authors' Computation (2026)

The CUSUM and CUSUMQ line, in Figure 1 and 2, trends within the 5% significance level, which approves robustness and stability of the model. The model is valid for forecasting and policy analysis as the regression model parameters are found to be stable.

5. Conclusion

The study addressed how digitalization and the money market instruments can enhance living standards in South Africa from 1992 to 2024. The ARDL bounds methodology was conducted as to achieve the aim and objective of the study. The key findings of the study indicate that digitalization proxied by mobile cellular subscriptions, treasury bills and certificate of deposits do enhance living standards as these factors were found to have positive implications on GDP per capita in the long run. Digitalization does not only promote economic productivity, but it also bridges the digital gap by raising the general quality of life through improved accessibility to financial services, education, skills development, and healthcare. Digitalization can help and expedite the fulfilment of each of the 17 Sustainable Development Goals (SDG). It is recommended that the government prioritize economic development in order to increase access to mobile cellular subscriptions, which will help improve the welfare of the population and accomplish the SDG's. Furthermore, a well-developed money market leads to improved financial intermediation and increased funding for production, ultimately increasing the country's standard of living (Uruakpa, 2019). Thus, programs and measures that will promote innovation, financial inclusion and the development of the money market should be put in place and implemented. Monetary and fiscal measures, including research and development programs. Regular risk assessments should be done, to identify and deal with vulnerabilities and threats that arise with digitalization. Cyber security measures should be in place, such as having firewalls, multi-factor authentication, encryption of sensitive data, and software security.

The study contributes to existing literature by highlighting the importance of digitalization, the money market and money market instruments; how they are crucial for a country's development and growth. Although certain limitations were encountered in the study in terms of literature that focus particularly on digitalization and the money market instruments on living standards. For future research purposes

the econometric model can be expanded on by including other monetary factors and doing a panel comparison analysis between African countries. To further see how such factors affect living standards including the overall economic activity in those African countries.

Acknowledgement

The authors, D. M. Kgomo and N. E. Ratombo, are thankful for the ongoing support provided by the University of Limpopo.

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