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ORIGINAL RESEARCH ARTICLE

Global Finance Trends on African Markets: Dynamism and Current Characterizations

Sulaiman Sani[1], Usman Sanusi[2], Petrovious Horton[3], Peter Yavizu Mhone[4] and Onkabetse A. Daman[5]

[1,3&4]Department of Mathematics, Faculty of Science and Engineering (FOSE), University of Eswatini, Kingdom of Eswatini
[2]Department of Mathematics and Statistics, Umaru Musa Yar'adua University, P.M.B. 2218 Katsina, Nigeria
[5]Department of Mathematics, University of Botswana, Gaborone

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ABSTRACT

We examine the dynamics of market arbitrage, market energies and market performance using commodity price (s), portfolio (p), and value of investment (v) to investigate current trends and their implications on the economic growth of African countries. We delve into several market inefficiencies like pricing arbitrage and how they impact opportunities and investment returns to provide novel insights into the characterizations of Africa's markets and their influence on global finance, assuming that the three entities (spv) are independent and identically distributed with each other on a rotating S to formulate a nexus of triple finance things $(s_i(t), p_j(t), v_k(t))$ and state the properties of associated market index. Our analysis leads to the construction of useful financial market characterization policies vital for securing financial transactions against shocks with random energy distributions across the continent.

INTRODUCTION

In financial markets, making decisions on asset prices are full of nexus promises. If a hedge fund manager trades assets in a market $Q(x,y,z)$ at i,j,k when x *is overvalued,* y *is shortened, and* z *is local for instance.* Nexus consideration will help him identify the best trade points that open up profitable synergies to the optimal decision *to invest or not,* Oksendal (2003) because of the broader outlook. In African markets where underdeveloped infrastructure forms a basis, the nexus of finance things will ensure that arbitrage opportunities are uncovered because of connected dimensioning and openness. In this respect, the proposed nexus approach of price-portfolio-value presented in this work is primarily for best of operations research for arriving at the optimal decision that salvages investment resources over the continent.

One primary trade concern in Africa today is how to deal with arbitrage portfolios for sustainable trading. This concern requires connected analysis, Damodaran, (2002) to boost investor confidence. Crockett (2003) indicates that if monetary regimes rest operational objectives on dynamics of inflation only as most African countries do, it cannot suffice for retarding forces like arbitrage. Several demerits in both management and optimization will surface especially in African markets, given its limited liquidity. First, our markets are volatile and can easily develop higher risk profiles dangerous for foreign investors. Furthermore, African markets will miss the needed efficiency and investment opportunities for boosting growth and development thereby losing trade with other continents. Moreover, if our financial markets fail to adopt the nexus strategy, portfolio stagnation during upward price trends and path signals to success will disappear over her trade horizons and so, the needed stability for attaining balance on the fulcrum is lost completely. For a holistic presentation of missing merits when nexus consideration is off analysis in the African context, Table 1 presents basic gains that disappear forthwith.

In light of Table 1, Africa can gain functional financial status with resilience if the nexus approach for market entities is analysed because of completeness. In the sequel, a price (s)-portfolio-(p)-value (v) nexus over a continuous time-rotating sphere S is constructed and analyzed. The aim is to present nexus mathematical analysis of the spv−dynamics over African financial markets strong enough to explain latent interactions of entities that strengthen African economies in global trade and business. Our motivation stems from the many operational benefits for best of global finance. The Boolean nexus designed here leads to innovative

Correspondence: Sulaiman Sani. Department of Mathematics, Faculty of Science and Engineering (FOSE), University of Eswatini, Kingdom of Eswatini. ✉ ssulaiman@uniswa.sz.

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applications that uncover hidden market properties vital for making profits, selecting what income level to invest and where to invest for higher yields, risk minimization and portfolio maximization over the continent.

For the sake of these benefits (Table 2), the analysis on S is carried out such that any trace given v for p at s is guaranteed at ease. Suppose a groupoid changes position on S. This occurs with intensity $\varrho(.)$ that detects path signals for understanding latency in any given incomplete markets in the continent. If a groupoid is displaced sequel to S, it represents either a downward or upward market turn with $\varrho(t,s,p,v)$. Consequently, there exists a probability measure P on Ω that induces a shift $\omega \in \Omega$ with state dependent transition probability value corresponding to that of a future market state leading to a set of analytic differential equations, Medhi (2003).

Table 1 Merits of Nexus Consideration in African Markets

Management	Efficiency	Opportunities	Resilience
Risk Identification	Price Discoveries	Open correlations	Supply chain Management
Failure Prevention	Feedback loops	Emerging markets	Better Planning
Risk Openness	Sentiment Analysis	Strategic Investment	Third Party Management
Portfolio optimization	Behavioral insights	Clarities	Innovative Integration

Table 2 Benefits Areas of the SPV Nexus in Africa Finance

Portfolio Management	Trade Related Risks	Financial Markets	Detection
Re-balancing	Identification	Properties	Anomalies
Re-Directing	Patterns	Arbitrage Trends	Dynamics
Gauging and Re-Gauging	Energies	Continentalities	Market turns
Characterization	Potentialities	Features	Market indexes

The choice of tripartite nexus is for extension and management. In the beginning, existing nexuses, Cowan et al. (2014) are trivial nexuses sequel to their construction, Boulila and Trabelsi (2004), Jayaratne and Strahan (1996) and Fratzscher and Rieth (2018). Though few tripartite nexuses with macroscopic approaches, Nwogugu (2019) and Roy and Shijin (2018) exist. Though financial economists have proved the existence of strong connections between finance and macroeconomics, Bracchi (2015), microscopic effects (hidden effects) within variables are strong in econometrics, Samanidou et al. (2006). Feng et al. (2012) indicate that complex interactions linking investment evaluations at different horizons occur at the microscopic level. This position is clearer for stochastically driven models, especially in the African market context proposed here over statistically fitting models hence, the econophysics paradigm, Jovanovic and Schinckus (2013) is adopted for the problem studied in this work.

2. Evolution Dynamics for African Markets

Consider a sphere S hinged at three points S, P, V and rotating continuously in time and space. We suppose that on each of the three-hinged points, there is a length meter L that translates linearly between three points i,j,k along the hinges of the rotating S. Let x be the state of some events starting at S sequel to the interplay between the rotating S and the translationally moving L. We say x changes value from x to x_i on S only if $S \to S_i$. If x moves from S to S_i and $x < x_i$ in value, then the corresponding transition $S \to S_i$ is a downturn on S and signifies some loss in value $x_i - x = -\epsilon_i$ of S. Otherwise if $x > x_i$, then $S \to S_i$ is an upturn and signifies some gains $x_i - x = \epsilon_i$ in the value of S. This policy holds good for the other points P and V on S that is; $P \to P_j$ or $V \to V_k$ yields new values p_j and v_k respectively and signifies either a gain or a loss in P or V values respectively. Suppose $p \to p_j$ is a loss in value when $P \to P_j$. Then $p_j \sim p_{-1}$ and the converse; that is $p \sim p_{+1}$ is a gain in value for P, then $p_j \sim p_{+1}$ on S. Denote by Γ a measurable function that describes the state of S at some chosen point say K where the points SPV each takes a random value over a Boolean space B. Then the measurable function Γ such that

$$\Gamma : S(SPV) \times [0,\infty) \times R \to B, \tag{1}$$

is a moduloid on S. Define a process $\{X(t),\zeta(t)\}$ where $X(t)$ is the number of times points S,P,V reaches K on S together but independently and $\zeta(t)$ is the past rotation time when S arrives $K(i,j,k)$. Looking at the rotation system at $K(i,j,k)$, the bi-variate process $\{X(t),\zeta(t)\} \sim \{X_{K(i,j,k)}(t),\zeta_{K(i,j,k)}(t)\}$ is a Markov process. We call each paired valued process

$$\{X_K(i,j,k)(t),\zeta_K(i,j,k)(t)\} = \Gamma_t = ijk, \tag{2}$$

on S a groupoid along the path (i,j,k) and denote it by Gi,j,k to represent a groupoid of the SPV moduloid $\vec{\mathbb{M}}$ on $\mathbb{S}$. If $i = 0$ then $Gi,j,k = G0_{,j,k}$ and corresponds to some vector $X_{0,j,k}$ on S with S in a *neutral state*, P at j and V at k. By extension, if $\vec{X}$ is at $---0,0 \to ,0$, then the groupoid $G0_{0,0}$ gives S,P,V in a *neutral position*. This way, $G-_{1,0,+1}(M)$ occurs when the SPV moduloid assumes a *neutral portfolio position*, an *extreme left price position* and an *extreme right value position*. By Zuckerman (2013), there exists a probability measure P and a set of Chapman-Kolmogrov differential equations satisfied by M equivalent to $^{S}G \subseteq M$ such that by Hammack (2013), we have

M = {G0,0,0,G−1,0,+1,G−1,0,−1,...,G+1,0,+1,G−1,−1,−1, G0,−1,0,G1,1,1}. (3)

Each G*i,j,k* ⊆ M is a market index relative to neutrals (0's), right extremes (+1's) and left extremes (−1's) in [−1,0,+1]. We design financial market characterizations for the moduloid M of the groupoid G*i,j,k* in B = [−1,0,+1] in line with Luo and Zhou (2013).

3. African Market Characterizations

To characterize M(G*i,j,k*), we tabulate G*i,j,k* alongside market features and their relative strength index ($\overline{RSI}$). In addition, we provide a new approach for characterizing markets using *Boolean algebra* identified here as $\overline{RSI}$ for ease of doing business, risk management and efficiency in market transactions as in Table 1. Simplified $\overline{RSI}$ measures help investors decide African trading routes, portfolio management and risk analysis easily, and identify potential market reversals by properties.

$$\overline{RSI} = 100 - \left(\frac{100}{1+\mathbb{G}_{i,j,k}}\right) = 100 - \left(\frac{100}{1+(i+j+k)}\right), \quad (4)$$

given that

1. If $0 \leq \overline{RSI} \leq 100$: Invest in the market a.s
2. If $\overline{RSI} = \pm\infty$: Do not invest in the market a.s
3. If $100 < \overline{RSI} < \infty$: Scarier market to invest
4. If $-\infty < \overline{RSI} < 0$: Scarier market to invest

$\overline{RSI}$. It is clear from Table 3 that the problem of *where to invest* over the continent is envisaged. In respect of (2), there are seven (7) financial markets to trade assets for profits. These financial markets are range bound market

Table 3 African Market Characterizations

$G_{i,j,k}$	Financial Markets	Features	$\overline{RSI}$	$\overline{RSI}$
$G_{0,0,0}$	Range Bound	Stability, Equilibrium, Control	40-60	0.00
$G_{-1,0,+1}$	Bullish Reversal	Recovery, Momentum, Upswing	30-50	0.00
$G_{-1,0,-1}$	Bearish Run	Pessimism, Oversold, Volatility	30-50	200
$G_{0,-1,0}$	Bearish Downturn	Panic, Plummet, Freefall	20-30	-∞
$G_{+1,0,0}$	Semi Bullish	Optimism, Low trend, Low volatility	20-30	+∞
$G_{+1,0,-1}$	Bearish Reversal	Resistance, Pullback, Breakdown	50-70	0.00
$G_{0,+1,0}$	Bullish Upturn	Optimism, Recovery, Momentum	50-80	50.00
$G_{-1,+1,0}$	Bullish Reversal	Recovery, Rebound, Upswing	30-50	0.00
$G_{+1,0,+1}$	Bullish Run	Uptrend, Confidence, Frenzy	50-70	66.67
$G_{-1,-1,-1}$	Extremely Bearish	Collapse, Freefall, Hopelessness	≤ 20	150.00
$G_{+1,+1,+1}$	Extremely Bullish	Optimism, Frenzy, Relentless Momentum	≥ 80	75.00

($G0_{,0,0}$), bullish reversal ($G-_{1,0,+1}$), bearish reversal ($G+1_{,0,-1}$), the bullish upturn ($G0_{,+1,0}$), the bullish reversal ($G-_{1,+1,0}$), bullish run ($G+1_{,0,+1}$) and extremely bullish market ($G+1_{,+1,+1}$). For safety and security, market investors should seek to invest in range bound markets because of limits and bounds. The bullish markets are fair investment markets especially for investors without investment volatility phobia. Bearish markets with reversals and upturns are fair markets for investing, especially for investors with long term hold for reasons of market dynamics and upturns. This position is a good sequel to characterizations 1 → 4 of (2) of the Boolean analysis, as displayed in Table 3. Equivalently and with these characterizations, prospective investors can understand where not to invest sequel to the methodology in this work as presented in Table 3.

Identifying likely profit African markets and associated correlated product features (see 1 → 4) places our financial markets and allied companies on several optimization paths along product allocations, minimizing stockouts and lost sales catering through proper market selections as in Table 3. African markets with supply chain processes can use the data displayed in Table 3 to improve supply chain efficiency as a consequence of the Boolean algebra-based analysis here that streamlines operations by prioritizing high-demand products of associated markets and reducing unnecessary holding costs by (4). For instance, a volatility minded foreign investor can be directed to invest in range bound market $G0_{,0,0}$ and one with high-risk profiles can be directed to hold assets in $G+1_{,+1,+1}$. Equivalently, the latter investor can target markets with upturns and bullish fronts, as summarized in Table 4.

4. Current Energy Quanta of African Markets

Several operational benefits can be derived from the market energy estimation presented here for investors on African soil. Chief among the benefits is the early detection of warning signs of market trends and reversals to avert trading risks. For this purpose, a Boolean consideration for assessing market energies in M(G*i,j,k*) is constructed. We state the following result in this respect.

Lemma 1 Suppose T and U represent the kinetic and the potential energies for an $---\rightarrow$

African market G*i,j,k* given *i,j,k*. The Lagrangian L associated with G*i,j,k* is given by

$$L(\mathbb{G}_{i,j,k}) = L(\overrightarrow{i,j,k}) = \frac{1}{2}m\left(\dot{r}^2 + r^2\dot{\theta}^2\right) + mgr\cos(\theta). \quad (5)$$

Here, r is the market radius, $\dot{r}$ is the rotational radial velocity and $\dot{\theta}$ is the angular velocity of the market due to the continuous time rotating S.

From classical dynamics, we have along the $x-y-z$ plane that

$$T(x,y,z)=\frac{1}{2}m(v_x^2+v_y^2+v_z^2), \tag{6}$$

where m is the market size and v is the velocity at hinged points i,j,k. Now, let $x = r\cos\theta$, $y = r\sin\theta$ and $z = 0$. The epimorphism of $L(x,y,z)$ into $L(r,\theta,0)$ such that $L(x,y,z) \rightarrow L(r,\theta,0)$ is a transformation that takes

$$L(\overrightarrow{r_i,\theta_j,0_k})=\frac{1}{2}m\left(\dot{r}^2+r^2\dot{\theta}^2\right). \tag{7}$$

In particular, r_i is the radial market position along i at hinged point S, θ_j is the angular market position along j at P and 0_k is that of the neutral state along V at k. Under uniform motion of the rotating sphere S, it is trivial that $r_i \rightarrow i$, $\theta_j \rightarrow j$ and the null vector $0_k \rightarrow k$ so that

$$T(\overrightarrow{r_i,\theta_j,0_k})=T(i,j,k)=\frac{1}{2}m\left(\dot{r}^2+r^2\dot{\theta}^2\right). \tag{8}$$

Equivalently, the potential energy U is given by

$$U=-mgy=-mgr\cos(\theta),\ \theta=90^\circ. \tag{9}$$

The lemma follows upon subtracting (9) from (8).

We compute the energy quanta $E(.)$ for M(Gi,j,k) to relate $E(.)$ with market stability for safety of investment. Energy analysis presents to managers market trends and patterns for understanding vitality. Managers of hedge funds can use $E(.)$ analysis to identify optimal asset allocation that maximizes returns while minimizing risk. Again, $E(.)$ analysis in the hands of psychologists is for predicting directions and potential reversals and upturns. It identifies factors influencing price movements and forecasts future prices to arrive at informed investment decisions. African markets with economic purposes can use $E(.)$ analysis here to measure market efficiency in the form of liquidity analysis that optimizes trading strategies by assessing impacts of large trades on market prices and portfolios. We make the following proposition.

Proposition 1 *In view of (5) with associated definitions, we state that if*

1. *$E = 0$ and sum(i,j,k) = 0: Extremely Stable market to invest.*
2. *$E < 0$, sum(i,j,k) = ±1: Highly Unstable with two-way single consequencial.*
3. *$E < 0$, sum(i,j,k) = ±2: Highly unstable with two-way double consequencials.*
4. *sum(i,j,k) = ±3: Three-way consequencials.*

Table 4 Energy Quanta and Stability Rating of Africa Markets

Gi,j,k	Net Energy	Boolean Sum	Market Stability Rating
G0,0,0	0	0	Extremely stable with no ± consequential
G−1,0,+1	-2m	0	Highly unstable with no ± consequential
G−1,−1,−1	-2m	-2	Highly unstable with double - consequentials
G0,−1,0	−m	-1	Highly unstable with single - consequential
G+1,0,0	0	+1	Extremely stable with single + consequential
G+1,0,−1	-2m	0	Highly unstable with no ± consequential
G0,+1,0	−m	+1	Highly unstable with single + consequential
G−1,+1,0	-2m	0	Highly unstable with no ± consequential
G+1,0,+1	0	+2	Extremely stable with double + consequential
G−1,−1,−1	-2m	-3	Highly stable with triple - consequentials
G+1,+1,+1	0	+3	Extremely stable with triple + consequentials

In respect of Proposition 1, Table 4 summarizes the energy characterization in the markets and their corresponding stability ratings

From Table 4, the range-bound market $G0_{,0,0}$ is the most stable market given the net energy value '0' and the Boolean sum '0'. Unfortunately, other stable markets are good for investing, with some numbered consequentials. They include semi bullish market $G+1_{,0,0}$, the bullish run $G+1_{,0,+1,}$ and the extremely bullish market $G+1_{,+1,+1}$. Generally, one can invest in any of the three (3) markets with some degrees of caution and attendant consequencials. The other markets in Table 4 are generally unstable to invest in view of their net energies and Boolean structures. If one studies the energy characterization in respect of the markets displayed in Table 3, it is still clear that the range bound market is further still the best market for investment

due to its superior $\overline{RSI}$ = 0.00, its net energy measure E = 0 and its Boolean sum 0.

One can envisage that investing in semi bullish market $G+1_{,0,0}$ is riskier

compared with other bullish markets. This is in view of the $\overline{RSI}$ = +∞ of the said market (Table 3) and its numbered positive consequential (Table 4) of +1 compared with those of other bullish markets analysed here. Most importantly, prospective investors are expected to measure up what quantities of investment funds should go to any of the bullish markets, taking into account their market ratings and the $\overline{RSI}$ for the safety of investment

funds. Finally, we concluded that the two characterizations presented in Table 3 and Table 4 are strong measures for answering the economic questions of *where to invest and what to invest in markets* as motivated in this work. In respect of Table 3 and Table 4, we can advise prospective investors to invest more resources in range bound markets and less resources in other markets, with bullish markets selected ahead of the bearish ones.

5. African Markets Versus African Countries

For the purpose of defining markets over country spheres for development sake, we extend the Boolean characterization of markets developed in this work over Africa so that improvement drives are developed for bettering African economies. By market characterizations across spatial horizons, multinationals and other financial entities can enhance investment decisions and optimize production supply chains. Additionally, spatial characterizations improve planning and increase operational efficiency through the creation of new business opportunities. Our choice of African countries is in view of needs for continental benefits only. Details of this spatial characterization are presented in Table 5. From Table 5, it is clear that Nigeria can raise her market levels from the extremely bearish position at the moment to the stable range bound level by working round the clock over three (3) negative consequential of insecurity (-1), high inflation (-1) and reduced Naira-Dollar exchange rate (-1). Again, these three (3) consequentials enjoin Nigeria to carry out transformation in three (3) steps for smoothness reasons. In view of Table 4, one path to

Table 5 Markets Over Country Scales for Prominent African Countries

Gi,j,k	Countries	Market Characterization
G0,0,0	Morocco, Botswana, Rwanda	Range-Bound Markets
G−1,0,+1	Ghana, Ethiopia, Uganda	Bullish Reversal Markets
G−1,0,−1	Somalia, South Sudan, Burundi	Bearish Run Markets
G0,−1,0	Zimbabwe, Central Africa, Congo Democratic	Bearish Downturn Markets
G+1,0,0	Namibia, Ethiopia, Kenya	Semi Bullish Markets
G+1,0,−1	Zambia, Mozambique, Angola	Bearish Reversal Markets
G0,+1,0	Cote d'Ivoire, Uganda, Somaliland	Bullish Upturn Markets
G−1,+1,0	South Africa, Egypt, Tanzania	Bullish Reversal Markets
G+1,0,+1	Botswana, Morocco, Senegal	Bullish Run Markets
G−1,−1,−1	Nigeria, Guinea Bissau, Somalia	Extremely Bearish Markets
G+1,+1,+1	Algeria, Egypt, Tunisia	Extremely Bullish Markets

achieving this transformation is coded as

$$[-1,-1,-1] + [+1,0,0] + [0,+1,0] + [0,0,+1] = [0,0,0]. \quad (10)$$

Thus, in the light of (10), Nigeria's journey to the range bound market characterization starts from achieving maximum security (since, coordinate is at radial position) as she zeros-in both inflation and currency exchange rates then work over inflation next and finally, stabilizes exchange rates. The time interval to achieve each phase of the market should be the shortest time path for this process in view of the unit circle analysis presented here so that the journey to the range bound phase is achieved in unity.

On the other hand, South African (SA) markets are bullish reversal markets at present with no positive or negative consequential. This implies that adjacent SA markets can choose to remain as they are at the moment or they should work to overturn their negative energy (corruption for instance) quanta to zero to achieve the range bound market status. Countries like Botswana, Morocco, and Rwanda enjoying the range bound status at the moment, are the best countries to invest in because of their stable market frames brought by huge successes in security, governance, and infrastructure and technology development.

6. Where Arbitrage Exists in Africa at Present

In Oksendal (2003), the characterization of arbitrage portfolios trading in markets is carried out. More precisely, a given portfolio θ trading in a market is called an arbitrage if the value $V^{\theta}(t)$ is such that

1. $V^{\theta}(t = 0) = 0.$
2. $V^{\theta}(t = T) > 0.$
3. $P[V^{\theta}(t = T)] > 0.$

In other words, θ makes money without any risk of making losses. Thus, one can extend items $1 \rightarrow 3$ to a somewhat simpler and easier-to-understand concept

of arbitrage in markets over the Boolean characterizations developed in this work. We state the following lemma.

Lemma 2 The striking feature of arbitrage in African markets is the positive (+) signs of associated real valued functions of measures and claims.

This is evident from $1 \rightarrow 3$ in view of Oksendal (2003). One can categorize arbitrage in trading markets by Lemma 2 via the Boolean codes developed in this work as follows.

Table 6 Arbitrage Characterizations Over Africa

G*i,j,k*	Markets	Arbitrage Characterizations	Signs
G0,0,0	Range-Bound	Minimal	000
G−1,0,+1	Bullish Reversal*	Might not exist	-++
G−1,0,−1	Bearish Run	Might not exist	-+-
G0,−1,0	Bearish Downturn	Might not exist	+-+
G+1,0,0	Semi Bullish	Exists	+++
G+1,0,−1	Bearish Reversal	Might not exist	++-
G0,+1,0	Bullish Upturn	Exists	+++
G−1,+1,0	Bullish Reversal*	Might not exist	-++
G+1,0,+1	Bullish Run	Exists	+++
G−1,−1,−1	Extremely Bearish	Might not exist	- - -
G+1,+1,+1	Extremely Bullish	Exists	+++

1. Arbitrage exists where Boolean codes carry (+++).
2. Arbitrage might not exist where Boolean codes carry at least one (-).
3. Arbitrage is minimal where Boolean codes are positively zeros.

On the basis of this characterization, the existence of arbitrage in African markets for sustainable trading is summarized as follows.

In view of Oksendal (2003) and the Boolean characterizations in Lemma 2 as summarized in Table 6, the following remarks can be made.

Remark 1 Arbitrage exists in African bullish markets.

This remark holds good except for the bullish reversal lying between semi bullish and bearish run markets because of two edges. The bearish reversal can be semi bullish (+) or bearish downturn (-) any time. Consequently, trading portfolios remain both optimistic and pessimistic. This way, we conclude that bullish reversals are double edge in terms of arbitrage characterizations over the African continent.

On the other hand, the range bound markets (neutral markets) has minimal arbitrage probability in view of Lemma 2 implying strong stability enjoyed by *African Finance Dynamism*...

The market sequel to the balance between buying and selling. Finally, observe that large number of bearish markets have at least one (+) sign. This situation ensures that some form of sliding path arbitrage may possibly exist over the continent, especially in the context of buying in bearish markets and selling in bullish markets. In this sense, arbitrageurs may likely hold trade portfolios in bearish markets and move such portfolios to bullish markets faster for easy profits.

From a spatial perspective, human and material contingencies from the run and downturn African countries, together with early upturns and semi-bullish countries, shall troop the market reversal countries (because of frequency; see Table 6) in the meantime before gaining opportunities to enjoy the stable markets of the range-bound African countries for arbitrage reasons (see Table 4). These dynamics will continue in time and space until African markets attain local stability with balanced trade across the continent.

CONCLUSION

We characterize financial markets using the emerging concepts of Boolean algebra and dynamics applied to this work. This exercise enables the construction of several markets: groupoids over a moduloid, Kamranialiabad, (2020) and their trading features stated and analyzed for optimal decisions along economics and financial paths to operations research and decisions. We are able to state some forms of market behavior for sustainable trade and industry in financial market operations for better management.

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COMPETING INTERESTS AND DECLARATIONS

The authors of this article hereby declare that there is no competing interest of any kind among authors. All authors work diligently throughout the making of the article. The following statement holds for this article:

1. Author Contributions: First author generates the topic and designs the path of the article in terms of results and methods. Second author formulates the problem and provides clarity support and Literature backing. Third author provides numerical analysis. Fourth author generates Tables and data contents, and Fifth author analyzes the entire work.

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