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ARTICLE

Fundamental Sources of Risk in Frontier Equity Markets

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Abstract

Asset pricing has attracted innumerable attention from many stakeholders in capital markets. However, a considerable lack of consensus exists regarding the full list and identity of risk factors and the ability of the already studied risk factors to optimally price risk. This problem is pronounced in frontier equity markets due to the unpredictability of the underlying risk fundamentals. We highlight that frontier equity markets are largely characterised by market frictions that misalign with the established asset pricing fundamentals, thereby complicating risk pricing using the existing frameworks. Other confounding factors include sizeable downside risk, stale prices, acute illiquidity, and unstable macroeconomic fundamentals. This study is based on these constraints. Using monthly data on a list of 16 macroeconomic variables from 20 countries between January 1996 and February 2020, we arrived at interesting results at a country level and in a combined sample. At the country level, the results were mixed. However, a pooled sample of the 20 markets revealed the existence of some commonalities among both domestic and global macroeconomic factors. The empirical evaluation using both Fama and MacBeth (1973) two-step and GMM regressions established that unanticipated inflation (UI), market-wide volatility (VOL), market liquidity (LIQ), consumer confidence index (CC), trade-weighted US dollar exchange rates (TW$) and VIX volatility index (VX) were not only significant drivers of risk variations but also priced in the returns of frontier equity markets. Given these results and the increased investor attention to these markets, a favourable policy environment is needed to accelerate capital market development and investment in these countries.

Keywords: Equity risk premia; Risk factors; Frontier markets

JEL classification: G00, G21, G51

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1. Introduction

Determining risk-return trade-offs in financial assets has been a weighty concern for various stakeholders in capital markets. The unpleasant reality that different assets earn different returns seems to not only beset investors, but also policy mandarins, asset managers, and more importantly, academic research in capital markets. To this end, factor identification has specifically carved a special niche within the broader clamour for the drivers of underlying innovations in stock prices. Empirically, financial economists are increasingly searching for practical methods to address the ever-elusive equity premium puzzle intertwined with the factor identification puzzle. Continuous discovery of priced risk factors in every issue of leading finance journals features as a plausible explanation for the conundrum. However, a keen observation of recent developments in the field yet presents another intriguing dynamic where a systematic shift is recorded toward factor identification procedures which in turn has further prompted considerable and deliberate attention towards conserving the parsimony originally envisaged in the classical factor identification procedures. In this study, we focus on macroeconomic fundamentals as the dominant predictors of stock returns in frontier equity markets. Macroeconomic factors have consistently been identified in asset pricing literature as the pervasive drivers of risk in stock markets around the world (Chen et al., 1986; Chen and Chiang, 2016; Pukthuanthong et al., 2019). And there is a consensus existing among the mean-variance equilibrium (CAPM) faction of asset pricing literature that a single factor, market beta is insufficient to price all securities in the stock market. The no-arbitrage (APT) faction, in addition, advocates for many pervasive state variables (common drivers) affecting securities returns. They, nonetheless, leave a compelling gap for the exact identity of these pervasive factors informing returns which vary from market to market.

Arising from this gap in knowledge, some empirical studies, such as Chen et al. (1986), have attempted to argue a theoretical justification for including specific macroeconomic variables such as the spread between long and short interest rates, expected and unexpected inflation, industrial production, and the spread between high and low-grade bonds, in the APT. So far, their variables/factors, in addition to some of them being traded, seem to form one of the more complete nested models in the no-arbitrage framework. Other fundamental factors like liquidity, commodity prices and currency fluctuations (risk) are increasingly getting the attention of researchers, especially in the less developed markets, as possible significant drivers of risk. However, there is no complete framework in place to adjudicate on a group or set of variables/factors that can jointly describe risk-return relationships, especially in Frontier Equity markets.

Focusing on liquidity as a systematic driver of risk; theoretically, it is referred to as the ease of transfer of value and wealth amongst investors at minimal or no cost. As underscored by Chordia et al. (2008), liquidity conveys microstructure information indicative of market efficiency. The illiquidity or inefficiency of the Frontier Equity markets often manifests itself through return autocorrelation, non-synchronicity in returns, and stale prices. Studies such as Bekaert and Harvey (2002) and Marshall et al. (2015) highlight these characteristics as possible explanations for the differences in return behaviour between mature markets and less developed markets. Empirically, Chordia et al. (2008) show that high liquidity is associated with better market efficiency. Further, illiquidity is also shown by Amihud et al. (2015) as an important factor capable of explaining expected return differentials in developed and Frontier Equity markets.

Liquidity, however, manifests itself in a variety of forms making it difficult to capture in returns. This difficulty has been highlighted by studies as common in markets with data paucity (see for example, (Batten & Vo, 2014; French & Taborda, 2018; Lischewski & Voronkova, 2012). Amihud and Mendelson (1986) in their seminal paper on liquidity risk, suggest the use of bid-ask spread: the larger the difference the more illiquid the asset or the market is, and vice versa. This approach, however, is extensively debated on the ground of its ability to capture market-wide liquidity, as it is portrayed to only address specific components of liquidity in the market, especially liquidity associated with transaction costs. As for this study, Bid-Ask Spread may provide challenges in the generalization of findings, because the sample of markets under consideration here experience spread caused by reasons, other than the transaction cost, such as infrequent trading, and non-synchronous trading (Hou & Moskowitz, 2005).

Currency fluctuations are also a risk factor commonly researched in asset pricing studies. Specifically, Frontier and emerging equity market studies have in many instances cited exchange rates risk as highly-priced in their returns (see examples such as, (Chkili & Nguyen, 2014; Reboredo et al., 2016). Asteriou et al. (2016) report that Frontier Equity markets are characterized by higher exchange rate volatility, which likely constitutes an important source of variability in returns for international portfolio investors. Volatile currency makes international portfolio investors vulnerable to greater uncertainties on their risk-adjusted returns hence they may require higher compensation in terms of higher risk premiums (Kodongo and Ojah, 2014). Thus, inasmuch as these markets, on average, offer higher returns on investment, and are therefore attractive for international portfolio diversification, their higher currency risk is a cost that the investors must include in their pricing calculus.

The commodity price is also a frequently cited risk factor receiving considerable attention among researchers and investors in Frontier Equity markets on the ability to influence stock returns. Investing in the commodities market has increased substantially in both developed and less developed markets (Boako & Alagidede, 2016). Differences exist though, for less developed markets, as some commodities, especially natural commodities like oil and minerals, command a significant proportion of export income, hence making these markets vulnerable to the international markets' stability. Commodities markets generally provide an alternative investment vehicle to equity investors as a viable diversification opportunity and as an asset class.

Given these grounds, a total of 16 macroeconomic variables comprising 7 domestic and 9 international factors are considered for the description of risk-return relations in 20 Frontier equity markets in this study. Results presented here suggest that unanticipated inflation (UI), aggregate liquidity (LIQ), and market volatility factors attract significant risk premiums in the majority of the markets in the study. Precisely, the risk price of UI is found statistically distinguishable from zero in Argentina, Bangladesh, Croatia, Kazakhstan, Kenya, Kuwait, Nigeria, Oman, Pakistan, Romania, Slovenia, Sri Lanka, and Vietnam. Albeit being significantly priced in 13 of the 20 Frontier equity markets, the factor is attracting a negative risk premium, except in Croatia and Argentina. There is an economic justification for a negative relationship between stock returns and inflation surprises: thus, the sign of the UI conforms to the *apriori* which stipulates that changes in unexpected inflation can influence the perception of investors regarding future cash flows eventually affecting the current prices.

Consequently, investors would require substantial compensation for taking on inflation risk (Virk, 2012). It is also possible to expect a significant relationship between stock returns and unexpected inflation because unexpected inflation accommodates new information regarding future rates of inflation which investors need in order to discount their future cash flows in real earnings. Azeez and Yonezawa (2006) argue that if the information is negative for the stock market, and if the newly released Consumer Price Index (CPI) data contain new information about inflation, then unexpected inflation should be associated with a decrease in stock prices at the time of the announcement because it influences nominal cash flows, hence the negative risk premium reported in this study.

Aggregate liquidity (LIQ) or market-wide liquidity factor is significantly priced, but the sign of the coefficient is negative, indicative of negative risk premiums for most of the markets it is priced in the sample. Negative risk premium displayed by the average coefficient of aggregate liquidity beta possibly postulates that low liquidity would prompt investors to demand higher future expected returns thus depressing the current stock prices evaluably leading losses that would ultimately yield negative risk premium. Surprisingly, two of the governance-related variables namely rule of law (ROL) and regulatory quality (REQ) seem to not command any significant risk premiums in the majority of the countries in the study, except Croatia, Jordan, Lithuania, and Mauritius.

At the individual country level, the results are mixed. However, a pooled sample of all 20 markets reveals the existence of some commonalities among both domestic and global macroeconomic factors. The empirical evaluation using both Fama and MacBeth (1973) two-step and GMM regressions established that unanticipated inflation (UI), market-wide volatility (VOL), market liquidity (LIQ), consumer confidence index (CC), trade-weighted US dollar exchange rates (TW$) and VIX volatility index (VX) were not only significant drivers of risk variations but also priced in the returns of frontier equity markets.

In section 2, we present the theoretical literature on asset pricing with keen attention to the fundamental drivers of returns in markets with trading frictions. The section also documents the relationship between the two dominant classical asset pricing theories of CAPM and APT. Section 3 describes the theoretical frameworks used in current asset pricing works. The empirical framework and the empirical models used to analyse this study are presented in section 4, while section 5 describes the data and further highlights the salient data paucities in the sampled markets. Section 5 also presents the asset pricing test in frontier equity markets. Robustness checks using the generalised method of moments (GMM) on a pooled sample of all the countries included in the study are provided in section 6. Section 7 concludes the study and sets forth the policy implication of the results.

2. Literature

Literature on Asset pricing theory and pricing of risk factors in financial assets have a long and controversial history in Financial Economics. At the inception of what is today known as modern asset pricing theory, Markowitz (1952) played a significant role in providing the theoretical foundation upon which many of the classical asset pricing principles are anchored. Markowitz's (1952) portfolio selection and mean-variance theories specifically informed theoretical underpinnings for Sharpe (1964), Lintner (1965), and Black (1972) who concluded that an asset's beta with respect to the market portfolio is an adequate measure for the cross-section of expected returns (the birth of Capital Asset Pricing Model, CAPM). The model's success has thus far been pinned on its parsimony, simplicity, and ability to describe risk-return trade-offs by using a single risk factor, the market beta to price financial securities, value companies, aid capital structure decisions, and determine investment decisions in capital markets.

2.1 The historical terrain of Asset Pricing Theory

The mean-Variance Portfolio (MVP) and Portfolio Selection theories of (Markowitz, 1952, 1959) are a natural launching pad for theoretical discussion in this study. This is primarily due to the tenets of the two theories which suggest among others that, through diversification, investors can maximize portfolio returns while minimizing the associated variance of their portfolio. Portfolio variance, in this case, is at the centre of asset pricing because the variance constitutes the quantum of risk in a given portfolio. Investors, however, do not hold one asset over a period or periods and consequently use the covariance or correlation between pairs of assets when determining an optimum diversification strategy. Thus, the Mean-Variance theory stresses that an individual security's risk is not of greater concern to an investor, but the security's contribution to the overall variance of the portfolio, measured as the covariance of that security with all other securities constituting the portfolio.

Sharpe (1964), Lintner (1965a), and Black (1972) later wittingly apply these principles to develop Capital Asset Pricing Model (CAPM). The authors' contributions have remained instrumental to the theory building in asset pricing due to its simple, tractable, and intuitive mathematical formula to derive a relationship between risk and returns in capital markets. CAPM algebraically relate the excess return of a portfolio to the excess returns of the market to determine the risk of a portfolio. The result of this mathematical relationship yields a coefficient or simply beta which quantifies the risk of returns. Empirically, a regression of excess returns of portfolio j on excess returns of market portfolio m produces a regression coefficient as the quantity of risk.

CAPM's empirical appraisal instantly became controversial. Naturally, a group of economists embraced the theory and the assumptions underpinning it, while another group critically questioned the tenability of some of the model's underlying assumptions. This precarious position rendered empirical evaluation of CAPM tendentious from the word go. One of the outstanding controversies has remained to be the use of a single risk factor, the beta to capture all possible risks imbedded in all assets trading in the market. McGoun (1993) argue that the intuition behind the model was well-known to investors long before it existed. McGoun critique that CAPM's quantification formula is just an applied mathematical gimmick with no material influence on the relation between earnings and changes in stock prices.

Restrictive assumptions associated with CAPM nonetheless remain the key issues of departure between proponents and opponents of the model. In one of the pioneering empirical evaluations, Black (1972) developed a variant of CAPM that ignores restrictive assumptions such as risk-free borrowing and lending, and short sales of risky assets. Black's version gained traction in many empirical appraisals of the model, only with a few adjustments such as the introduction of the intertemporal setting by Merton (1973) to address the unrealistic static position adopted by the founders. Fama and MacBeth (1973) on their part introduced an effective empirical procedure for testing CAPM. Their innovation remains relevant to date and is almost like a force of nature in empirical asset pricing. Despite many technological developments, new evaluation techniques, and even advancements in statistical and econometric analysis, Fama-MacBeth (FM) procedure still dominates empirical asset pricing tests (Feng et al., 2019; Harvey & Liu, 2019; Pukthuanthong et al., 2018; Sun, 2018).

2.2 Arbitrage Pricing Theory (APT)

The APT model forms a significant theoretical basis upon which risks associated with financial assets can be modelled. Ross (1976) presents a linear k-factor return-generating process of the form:

$$\tilde{r}_i = E_i + b_{i1}\tilde{f}_1 + \cdots + b_{ik}\tilde{f}_k + u_i i = 1, \cdots, n \quad (1)$$

where E_i the expected return of asset i, $\tilde{r}_i$ is n-dimensional vector of random return of asset i. $\tilde{f}$ is the vector of common factors ($\tilde{f} = 1, \cdots, k$) postulated to influence returns of all the assets in the market with up to k common factors. b_{ik} measures the sensitivity of returns to the movement in common factors $\tilde{f}_k$. The last term in the equation, u_i is the unsystematic component which is only idiosyncratic to the i^{th} asset. In empirical estimations, the idiosyncratic term should be normally distributed with mean zero, $E(u|f_j) = 0$, and constant variance, σ_u.

Considering the algebraic relations depicted in equation (1), it is evident that APT shares the zero-beta asset portfolio assumption with the CAPM. And similar to CAPM, the zero-beta asset in APT is proxied by the one-month Treasury bill which is postulated to have zero covariance with the other common risk factors. The expected return of an asset under the APT can be expressed as a linear combination of the factor sensitivities and the factor weights, where factor weights take the form $\lambda_0, \lambda_1, \cdot, \lambda_k$, such that

$$E_i = \lambda_0 + \lambda_1 b_{i1} + \cdots + \lambda_k b_{ik}, \textit{for all } i \quad (2)$$

This being the case, then one of the difficulties faced by empirical asset pricing researchers is to identify the pervasive factors, f_k, in order to estimate equation (2).

Classical asset pricing literature conjectures that only a small number of pervasive state variables can fully describe cross-sectional variation in stock returns (Breeden, 1979, 2005; Lucas Jr, 1978; Rubinstein, 1976). Ross (1976)'s proposition is anchored on the no-arbitrage principle which suggests that few macroeconomic variables would suffice to significantly explain the variations in stock returns.

The Arbitrage theory, just like CAPM has attracted numerous empirical appraisals. Several tests agree with Ross's hypothesis concluding that there is indeed more than one state variable responsible for return variations (see Chen (1983); and Roll and Ross (1980), particularly in the developed equity markets where the bulk of the tests have been done. However, even within the developed markets circles, most of the debate on Ross's hypothesis has been about the identity of the pervasive macro factors. The APT advocates for k return generating pervasive state variables whose clear identities are not provided by the theory. Therefore, the main purpose of the present study is to use a tractable factor identification strategy that can arrive at the optimal perversive macroeconomic factors in the Frontier Equity markets. In the early literature, factor analysis procedures were preferred to gather the state variables (Bilson et al., 2001). Like many procedures, factor analysis is not without its strengths and shortcomings. For instance, researchers such as Fung and Hsieh (2004) and Kelly and Pruitt (2015), who support the procedure, argue that it offers several macroeconomic variables a chance to be included in a pricing equation as reduced principal components. Others such as Dhrymes et al. (1984) note that the procedure is not accurate, specifically pointing out that its application in Roll and Ross (1980) is not stable given that the number of factors determined increases with the number of securities analysed.

One of the early studies to try to identify a possible set of factors for the APT is Chen et al. (1986), who argue that their set of factors accounts for major variations in the economy and has the ability to influence expected cash flows and general performance of firms in the economy. In the spirit of Chen et al. (1986), Nijam et al. (2018) investigate macroeconomic determinants of stock market returns in Sri Lanka using exchange rates, goods prices, interest rates, production index, market stress index, money supply, dividend yield, liquidity, and volatility of the stock market. Their results indicate that the industrial production index, interest rate, and exchange rates positively and significantly influence stock returns of the Colombo Stock Market, while variables such as inflation (goods prices) have a negative impact on stock returns.

Chiang and Chen (2016) also find evidence linking the Taiwanese stock market to a number of global and local factors. This study among many has given clear evidence that the investment environment in most emerging and Frontier markets can easily be predicted by the movements in major international stock market events, for instance, both Nijam et al. (2018) and Chiang and Chen (2016) use a global factor proxied by S&P 500 index and establish strong statistical evidence that the variable is significantly priced in the returns of the two markets investigated. They also show that the distress measure of the US market is negatively priced in the stocks of the two tested markets, indicating cointegrating movements, or close covariance of the US markets and the markets.

2.3 General Empirical Asset Pricing Literature in Frontier Equity Markets

Empirical asset pricing in Frontier Equity markets has produced results that fundamentally expose their special risk characteristics. For instance, liquidity has been discovered to have better statistical resonance in evaluating risk-return trade-offs in Frontier Equity markets compared to developed markets counterparts (Bekaert et al., 2007; Rouwenhorst, 1999). Momentum and Profitability factors have also proved more potent in empirical appraisals of firm fundamental factors in Frontier and emerging equity markets (Skočir and Lončarski, 2018b; Zaremba, 2018; Zaremba and Szyszka, 2016; Selebogo and Kodongo, 2020). Other notable sources of liquidity premium that literature pronounces to be severe in Frontier Equity markets include exogenous transaction cost, demand pressure, inventory risk, information asymmetry and search friction (Amihud, Mendelson, and Pedersen, 2006).

One would not help but notice that, despite the suspicion that institutional variables may be responsible for innovations in the underlying drivers of risk in these markets, research has either chosen to ignore or omit institutional and governance variables in explaining risk-return trade-offs in Frontier Equity markets. Despite their significance on the business environment, (Cule & Fulton, 2013), governance indicator variables, have received little attention on their direct impact on securities returns in Frontier Equity markets.

However, more recent studies are nonetheless increasingly incorporating governance indicator variables such as voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, the rule of law, and control of corruption in determining the risk-return relations across markets. For instance, Cao et al. (2019) establish that local corruption leads to stock price crashes in China. Ahmed (2020) uses the system GMM to explore the impact of corruption on equity market performance in a broad sample of Islamic and conventional equity markets in emerging and developed markets. Their results show that corruption exerts significant negative effects on conventional and Islamic stock returns alike. Ahmed (2020) further exposes that, conventional and Islamic emerging countries markets are more sensitive to corruption than developed countries' stock markets.

Sherif and Chen (2019) investigate the impact of governance quality variables; accountability, level of corruption, and governance effectiveness on momentum premiums in the international setting and establish that the quality of governance consistently affects international momentum profits. Nguyen et al. (2019) similarly employ system GMM to investigate the impact of institutional environment, government effectiveness, regulatory quality, rule of law, and control of corruption and produce evidence suggesting a significant positive impact of the variables on stock return co-movements between a selected emerging and US stock markets.

3. Theoretical Angle of Asset Pricing

Theory of asset pricing conjecture that there exists a linear combination of the covariance matrix of risky assets and certain risk factors in the stock markets. The Capital Asset Pricing Model (CAPM) of Sharpe (1964), Lintner (1966) and Black (1972), and the Arbitrage Pricing Theory (APT) of Ross (1976) provide theoretical foundations for this relationship. CAPM predicts that market beta describes returns of all risky assets in the market while the APT postulates the existence of more than one pervasive risk factor influencing financial asset returns. Both models are predicated on the principle that investors are compensated in the marketplace for bearing systematic risk.

Cochrane (2009) suggests a theoretically, but empirically tractable asset pricing method to price all the financial assets in the market. While incorporating the assumption of no-arbitrage opportunity, Cochrane (2009) argues that an assets payoff can be represented in the form of equation (3);

$$p_t = E(m_{t+1}, x_{t+1}) \tag{3}$$

where p_t is the price of an asset, x_{t+1} is the future payoff of the stock, and $mt + 1$ is a stochastic discount factor (SDF), also referred to as the intertemporal marginal rate of substitution of consumption and as the pricing kernel. Cochrane (2009) maintains that the SDF procedure can be used to evaluate any asset in the market. The approach, therefore, has the ability to encompass many of the asset pricing models such as CAPM, Consumption CAPM, APT, and the Intertemporal CAPM. Given this generality in application, the stochastic discount factor (SDF) m_{t+1} can thus be presented in a multifactor pricing model to accommodate all the factors expected to be identified in this study. Assuming the existence of the no-arbitrage principle, the stochastic discount factor m_{t+1} exists for any asset returns, $r_{i,t}$, such that:

$$E_t[m_{t+1} r_{i,t+1}] = 0 \tag{4}$$

$$m_{t+1} = \beta \frac{u'(C_{t+1})}{u'(C_t)} \tag{5}$$

where m_{t+1} is the stochastic discount factor or the pricing kernel $u(C_{t+1})$ is marginal utility function of one period ahead consumption or time $t + 1$, while $u(C_t)$ is the marginal utility at time t.One period return can be expressed as $E_t[r_{i,t+1}] = \frac{Cov(m_{t+1}, r_{i,t+1})}{Var_t(m_{t+1})} - \frac{Var_t(m_{t+1})}{E_t(m_t+1)}$

the first term on the right-hand side corresponds to $\beta_{i,t}$ which is a loading on systematic risk factor exposure and the second component on the right of the equation corresponds to λ_t defined as the price of risk associated with the factors. It follows that, in the stochastic discount factor (SDF),

m_{t+1}, the risk factor loading is a linear relationship with risk factors, f_{t+1}. Without loss of generality, a simple linear combination of the factor loadings and factor risks for the $r_{i,t+1}$ takes the form;

$$r_{i,t+1} = \alpha_{i,t} + \beta_{i,t} f_{t+1} + \epsilon_{i,t+1} \tag{6}$$

where $E_t(\epsilon_{i,t+1}) = E_t[\epsilon_{i,t+1} f_{t+1}] = 0, E_t[f_{t+1}] = \lambda_t$, and $\alpha_{i,t} = 0$ for all i and t. Equation (6) is the launching pad for any asset pricing model. The equation has yielded a number of controversies, especially in its empirical implementation. Theoretically, mean-variance efficiency achieves the objectives of (6) by imposing a zero-value restriction on the first term of the equation, the alpha (). The risk factor f is expected to price all the securities in the market.

An observation can be made about the modelling approaches used in the literature to determine the optimum $\beta_i f_{t+1}$ in (6): there is a dedicated group of researchers who perform dimensionality reduction of the many observed and tested risk factors using portfolios constructed on those characteristics. For example, the strand that follows Fama and French (1993) style constructs portfolios related to the observed size and value characteristics. This group of researchers traces the transition of firms within a portfolio by rebalancing the portfolio at the beginning of every year.

However, Kelly et al. (2020) propose the use of Instrumented Principal Components Analysis (IPCA) to identify the right factors from the list of possible RHS factors. The method is able to distinguish between two sets of factors relevant to asset pricing. The first set is the group responsible for common movement in stock prices; they are pervasive. The second set involves factors that move prices but are not associated with systematic risk premiums. They specifically note that, although these factors do not necessarily have associated risk premia, the fact that they alter return differentials makes them viable candidates for investment considerations by the market participants. In the same breadth, Pukthuanthong et al. (2018) also employ an elegantly crafted empirical protocol to identify the real risk factors in asset pricing to evaluate equation (6). Their method, which we employ in this study is able to distinguish factors that drive returns from the ones that actually command risk premium.

4. Empirical Implementation Strategy

The APT procedure discussed here uses multifactor pervasive state variables in Frontier Equity markets to evaluate their ability to price risk. Empirical evaluation of APT as applied in this study also intends to address the market integration hypothesis by including international macroeconomic variables cited in extant asset pricing literature with some degree of influence on cross-border trading and international portfolio diversification. Equation (7) is more of a theoretical than empirical relationship. Nonetheless, the equation is used to describe the relationship between macroeconomic risk factors and stock returns R_{it}.

$$R_i = \alpha_i + \sum_{d=1}^{D} \beta_{i,d} F_k^K + \sum_{h=1}^{H} \delta_{i,h} F_h^H + \epsilon_i \tag{7}$$

R_i is the vector of M individual stocks returns, and i is constant providing a test for the efficiency of the selected factors in explaining the asset returns. In many asset pricing tests, especially the mean-variance efficiency criterion, the closer the estimated values of α_i to zero, the better the ability of the right-hand side factors in explaining return variations. Since we are not assuming the integration, $\beta_{i,d}$ is the coefficient of the domestic variables category that is considered important in describing risk-return relations, and $\delta_{i,h}$ is the coefficient of global macroeconomic risk factors. β_i, d measures the sensitivity of frontier markets' return to domestic factors, while $\delta_{i,h}$ measures the sensitivity to global factors. α_i is theoretically expected to be zero if the factors included in the model adequately describe returns of Frontier countries' stock markets. $F^D$and F^H respectively denote the possible universe of domestic and global factors included in the analysis.

Domestic macroeconomic variables that form F^D include inflation, aggregate liquidity, governance variables, broad market volatility, and money supply. While global variables include the agricultural commodity index, and global consumer confidence indicators (US). Consumer confidence), global debt variables (term spread and term premium), metal index, a proxy for global market index, oil prices, trade-weighted exchange rates, and the global volatility index (VIX).

5. The Price of Risk in Frontier Equity Markets

To define and derive the other macroeconomic factors, we largely adopt the procedures put forward by Chen et al. (1986) as already discussed. The global versions of macroeconomics are defined by the weighted averages of GDP per capita in U.S. dollars. In computing unanticipated inflation (UI), we employ the procedure of Cooper et al. (2019) who define UI as $UI_t \equiv I_t - E[I_t|t-1]$ and change in expected inflation (DEI) as $DEI_t \equiv E[I_{t+1}|t] - E[I_t|t-1]$. Inflation I_t is derived using changes in monthly CPI for each country as $I_t = logCPI_t - logCPI_{t-1}$. Expected inflation, on the other hand, is defined as $E[I_t|t-1] \equiv r_{f,t} - r_{i,t}|t-1$ where $r_{i,t}$ is the return on real interest rates, or realised earnings from 3-month treasury bill rate minus the rate of inflation defined as $r_{i,t} = r_{f,t} - I_t$.

Other global macro variables constructed using the intuition of Chen et al. (1986), but with the insights of Cooper et al. (2019) include global term premium (GTP) and global default spread (GDS). Since country-level and firm-level data are not easily available to construct term premium and default spread at the domestic level, we construct these factors using global measures and include them as part of exogenous global macroeconomic factors. Global term premium GTP is, therefore, defined as the spread between the U.S GDP-weighted yield of ten-year bonds and the one-year Treasury bonds yield. GDS is constructed using the yield spread between Moody's Baa and Aaa corporate bonds.

Aggregate volatility (VOL) is calculated from each country's stock market index using a simple GARCH (1,1) process similar to the one employed by Syriopoulos et al. (2015). Aggregate liquidity (LIQ) definition on the other hand relies on the principles outlined by Pástor and Stambaugh (2003), but with a slight modification. Specifically, our measure makes use of monthly stock returns, monthly trade volume, turnover and monthly aggregate stock returns. Monetary theory relate money supply to aggregate economic activity. In relation to influence on aggregate economic activities, a number of influential studies have documented a link between money supply and stock returns across the world. In a recent example, Thanh et al. (2020), find that changes in money supply (monetary policy shocks) have a significant lagged impact on stock prices in India. Ouma and Muriu (2014) test the impact of money supply alongside three other macroeconomic variables on stock prices in Kenya and find significant evidence detailing that money supply has a positive impact on stock returns in the Nairobi Securities Exchange. In this study, broad money supply (M2) is used alongside 17 other macroeconomic variables.

Other global macroeconomic variables included in the study comprise of Agricultural commodity index (AGR), US consumer confidence (CC), IP industrial production index, return on the composite metal index (MTL), Morgan Stanley Capital International Index (MSCI), changes in brent crude oil prices (OIL), US trade-weighted exchange rates (TW$) and 30-days S&P 500 options volatility index (VIX).

To evaluate the ability of the defined factor on returns of frontier equity markets, the study uses an equal weight portfolio of industry returns with complete observations on 16 macroeconomic factors to investigate the priced macroeconomic variables in each of the markets in the sample. The construction of industry portfolios has often presented a challenge for asset pricing in markets with trading frictions. To counter the shortcoming, we implement a procedure introduced by Berger et al. (2011) to construct equal-weight industry portfolio returns even for countries without complete industry data. Data are obtained from Thompson Reuters DataStream. Analysis conducted in this section is done using Fama and McBeth (1973) two-pass regression procedure, and the errors and t-stats are calculated using the Newey and West (1987) adjustment with six lags.

Table 1 reports each country's results of the standard two-pass regression of Fama and MacBeth (1973) using a portfolio of industry returns. The estimated prices of risk shown by the average beta coefficients of each of the macro factors are evaluated on the size of the accompanying t-statistic. A variable is only considered significant or priced when the associated t-stat of the risk price (λ) is at least 2.0, and significantly different from zero at a 5% level of significance. The sign of the average beta coefficient indicates the relationship between returns and the macro variables.

The variables comprising 7 domestic and 9 international factors are considered for the description of risk-return relations in 20 Frontier Equity markets. Results in Table 1 suggest that unanticipated inflation (UI), aggregate liquidity (LIQ), and market volatility factors attract significant risk premiums in the majority of the markets in the study. Precisely, the risk price of UI is found statistically distinguishable from zero in Argentina, Bangladesh, Croatia, Kazakhstan, Kenya, Kuwait, Nigeria, Oman, Pakistan, Romania, Slovenia, Sri Lanka, and Vietnam. Albeit being significantly priced in 13 of the 20 Frontier Equity markets, the factor is attracting a negative risk premium, except in Croatia and Argentina. There is an economic justification for a negative relationship between stock returns and inflation surprises: thus, the sign of the UI conforms to the *apriori* which stipulates those changes in unexpected inflation can influence the perception of investors regarding future cash flows eventually affecting the current prices.

Consequently, investors would require substantial compensation for taking on inflation risk (Virk, 2012). It is also possible to expect a significant relationship between stock returns and unexpected inflation because unexpected inflation accommodates new information regarding future rates of inflation which investors need to discount their future cash flows in real earnings. Azeez and Yonezawa (2006) argue that if the information is negative for the stock market, and if the newly released Consumer Price Index (CPI) data contain new information about inflation, then unexpected inflation should be associated with a decrease in stock prices at the time of the announcement because it influences nominal cash flows, hence the negative risk premium reported for the 11 Frontier Equity markets.

Aggregate liquidity (LIQ) or market-wide liquidity factor is significantly priced, but the sign of the coefficient is negative, indicative of negative risk premiums for most of the markets it is priced in the sample. Negative risk premium displayed by the average coefficient of aggregate liquidity beta possibly postulates that low liquidity would prompt investors to demand higher future expected returns thus depressing the current stock prices evaluably leading losses that would ultimately yield negative risk premium. Surprisingly, two of the governance-related variables namely rule of law (ROL) and regulatory quality (REQ) seem to not command any significant risk premiums in the majority of the countries in the study, except Croatia, Jordan, Lithuania, and Mauritius. The associated t-statistics of the two variables fall short of the established cut-off point indicating their inability to systematically influence returns variations in all the three markets in the sample.

The results here are in contrast to the empirical evidence presented by Sherif and Chen (2019) who establish that governance indicators such as accountability, government effectiveness, and control of corruption significantly influence international momentum profits. However, any conclusion regarding momentum patterns needs to be taken with a grain of salt, because of the inconsistencies surrounding momentum profits. Furthermore, this study has used equal-weighted industry portfolios. The average beta coefficient of stock market volatility VOL is established to be statistically different from zero in all of the markets. Volatility as has been observed in this study, commands substantial risk premium mainly due to its pervasiveness and magnitude in the Frontier Equity markets.

One of the characteristics established earlier in this study is that the markets in the sample are heavily characterised by persistent volatility, especially at the macro level. Volatility results from market sentiment, news regarding fundamental drivers in the economy and the general state of the economy. The characteristics established so far indicate that the markets under consideration here present quite volatile macroeconomic environments, partly due to unfavourable political environments and due to weak institutional capacities (Thampanya, Wu, Nasir, and Liu, 2020). This should, however, not be surprising as the factor is directly constructed from the overall prices of all markets comprised in the industry portfolios. Money supply, MS, yields modestly significant risk premiums in five markets. This is more so in oil-producing countries with the average beta coefficients significantly different from zero at the 5% level except for Tunisia (t=1.69). The positive relationship between money supply and stock returns gets theoretical support from the Quantity Theory of Money (QTM). Friedman and Schwartz (1963) hold that money supply influences economic activities resulting in an increase in cash flows which leads to higher demand for financial stocks as an outlet for excess liquidity. Our findings here partly contrast those of Bahloul et al. (2017), who report mixed evidence on changes in money supply in a panel of developed, emerging, and frontier markets. In our results, money supply only attracts significant risk premiums in 5 of the 20 markets.

Table 1: Fama-MacBeth Local factors Results for Frontier markets based on APT

	Local Factors													
	DEI		UI		LIQ		REQ		ROL		VOL		MS	
	λ_{DEI}	t −stat	λ_{UI}	t −stat	λ_{LIQ}	t −stat	λ_{REQ}	t −stat	λ_{ROL}	t −stat	λ_{VOL}	t −stat	λ_{MS}	t −stat
Argentina	5.18	1.41	3.25***	**4.08**	-9.33**	**-2.89**	4.40**	**2.68**	0.41	1.01	-17.55**	**-2.94**	1.13	1.59
Bahrain	3.74	1.07	-1.50	-1.43	-5.27**	**-2.55**	1.03	1.01	1.74*	**1.78**	-1.56**	**-2.63**	7.32***	**5.11**
Bangladesh	0.23	1.35	-1.24**	**-2.94**	-5.25**	**-2.64**	4.26	1.62	0.27	1.44	-1.28**	**-2.17**	0.28	1.57
Croatia	5.79*	**1.72**	2.54	**2.46**	-0.29	-1.92	3.05	1.37	1.08	1.62	-2.05***	**-18.24**	0.30	1.12
Jordan	-1.09**	**-2.10**	-0.32	-1.51	-1.55***	**-3.16**	4.75	1.06	0.02	1.30	-0.25***	**-4.50**	1.48***	**4.32**
Kazakhstan	0.46	1.48	-1.84**	**-2.48**	-0.22***	**-4.40**	2.60	1.54	0.20	1.12	-1.04**	**-2.54**	1.11	1.58
Kenya	0.54	1.36	-0.23**	**-2.29**	-1.31***	**-18.64**	-0.61	-1.43	-2.30	-1.35	-2.20**	**-2.31**	4.19	1.11
Kuwait	0.41	-1.24	-0.12***	**-13.50**	-2.08***	**-57.87**	0.55	1.11	0.26	1.57	-2.31**	**-2.94**	0.27	1.59
Lithuania	-1.03**	**-2.62**	-2.08	-1.02	-7.12***	**-3.11**	-4.17	-1.57	-1.22	-1.63	-2.26**	**-2.60**	-5.31	-1.47
Mauritius	1.15**	**2.60**	-0.06	-1.53	7.08***	**-3.35**	0.34	1.48	0.11***	**7.03**	-0.13**	**-2.29**	11.14***	**16.38**
Morocco	0.11	-1.37	-1.19	-1.04	-2.27***	**-4.59**	2.35	1.16	0.43	1.25	-6.51**	**-2.12**	1.76	1.51
Nigeria	0.17	-1.55	-8.26***	**-5.55**	-3.35***	**-3.83**	1.44	0.44	1.53	0.48	_1.32**	**-2.44**	5.07	1.19
Oman	-22.08	-1.13	-4.28**	**-2.06**	-1.47**	**-2.06**	-6.67	-1.53	-1.47	-1.35	-7.40**	**-2.24**	3.46**	**2.59**
Pakistan	-1.08	-1.63	-1.25**	**-2.58**	-1.42***	**-4.30**	-1.58	-1.21	-1.75	-1.53	-0.49***	**-46.09**	5.06	1.70
Romania	-0.16	-1.59	-0.20***	**-42.09**	-0.44***	**-3.54**	0.88	1.86	1.32	1.16	-0.75***	**-4.27**	11.13	1.36
Serbia	-0.75	-1.27	-2.32	-1.60	-0.13***	**-17.78**	-0.46	-1.58	0.03	1.38	-0.16***	**-5.02**	0.18	1.48
Slovenia	-0.25	-1.64	-0.65***	**-4.11**	-0.35	-1.01	-0.05	-0.26	0.75	1.61	-0.45	**-1.71**	2.14	1.61
Sri Lanka	-2.14	-1.02	-0.30***	**-85.62**	-1.81**	**-2.25**	-0.64	-1.24	-0.47	-1.13	-0.31**	**-2.11**	0.14	1.57
Tunisia	-0.32	-1.40	-0.27	-1.14	-0.21**	**-2.47**	0.16	1.63	-0.11	-0.06	-0.05***	**-73.45**	0.30**	**1.99**
Vietnam	-0.20	-1.58	-7.57**	**-2.65**	-0.06**	**-2.73**	1.71	1.31	0.18	1.29	-0.85*	**-1.94**	0.12	1.35

Table 1 presents summarized results of Fama and MacBeth (1973) regressions of industry portfolio returns on macroeconomic risk factors. The abbreviations DEI stands for changes in expected inflation, UI is unanticipated inflation, LIQ is aggregate liquidity, REQ is regulatory quality, ROL is rule of law, VOL is aggregate volatility, while MS is changes in M2 money supply. λ is the price of risk for domestic macroeconomic factors in each of the Frontier Equity markets included in the study. Standard errors and t-statistics are calculated using the Newey and West (1987) adjustment with six lags. *, **, and *** respectively indicate that the reported coefficients are statistically significant at 10%, 5%, and 1% levels

Table 2 presents summarized results of Fama and MacBeth (1973) regressions of industry portfolio returns on macroeconomic risk factors. The abbreviations AGR stands for agricultural commodity Index, UCC is United States consumer confidence index, GTP is global term premium, GDS is global default spread, MTL is metal index, GI is global stock market return index, OIL is the changes in brent crude oil, TW$ is US trade-weighted exchange rates index, while VIX is the US volatility index. is the price of risk for global macroeconomic factors in each of the Frontier Equity markets included in the study. Standard errors and t-statistics are calculated using the Newey and West (1987) adjustment with six lags. t-statistics above the 5% (1%) critical level are in bold and italics.

Turning to global macro factors, results provided in Table 1 indicate that most of the Frontier Equity markets are exposed to innovations in the global macroeconomic environment. Agricultural commodity Index, US consumer confidence, Global stock market index, oil prices, US dollar trade-weighted exchange rates and US volatility index command significant risk premiums in a good number of the countries included in this study. This finding underscores the significance of global risk factors in the stock market investment in the Frontier Equity markets. Having discovered at the factor identification phase using canonical correlations that many of the factors in this category are significantly related to the total volatility of returns in these markets, the results in Table 1 appear to suggest that these markets may be integrated with the global markets.

Table 2: Fama-MacBeth Global Results for Frontier markets under APT

	Global Macroeconomic Factors																	
	AGR		UCC		GTP		GDS		MTL		GI		OIL		TW$		VIX	
	λ_{AGR}	$t-$stat	λ_{UCC}	$t-$stat	λ_{GTP}	$t-$stat	λ_{GDS}	$t-$stat	λ_{MTL}	$t-$stat	λ_{GI}	$t-$stat	λ_{OIL}	$t-$stat	$\lambda_{TW\$}$	$t-$stat	λ_{VIX}	$t-$stat
Argentina	0.18	**2.53**	-0.86	1.28	0.19	1.28	0.01	-0.71	0.09	1.06	-0.16	**-4.14**	-0.24	**-2.88**	-0.31	**-2.82**	-0.39	**-3.90**
Bahrain	-0.25	**-2.07**	-0.61	**-3.50**	-0.38	1.68	-0.14	1.06	-0.03	-1.87	-0.67	**-3.09**	0.43	**7.35**	-0.19	-0.89	-0.20	**-7.64**
Bangladesh	0.30	1.41	-0.31	-1.29	-0.32	-1.82	0.33	1.78	-0.34	-1.52	0.35	**-2.30**	0.36	**2.72**	0.37	0.32	-0.38	-1.33
Croatia	0.18	**2.86**	-0.55	**-2.58**	-0.30	-0.12	0.05	1.44	0.18	-2.75	0.55	**-3.46**	0.30	**2.23**	0.05	**2.14**	-0.18	**-2.93**
Jordan	-0.19	**-3.26**	-0.17	**-2.07**	0.41	1.32	0.64	1.11	0.29	**1.99**	0.10	**-2.14**	0.33	**4.61**	0.36	**2.99**	-0.79	**-4.18**
Kazakhstan	-0.49	**-3.66**	0.19	-1.60	-0.24	-1.62	0.62	1.83	-0.03	-1.18	0.38	**-2.67**	0.76	**2.85**	0.14	**3.66**	-0.51	**-4.06**
Kenya	0.26	**4.10**	0.75	-1.14	-0.44	-1.92	-0.13	-1.50	-0.82	-1.42	-0.51	**-6.71**	-0.20	**-2.25**	-0.89	**-2.36**	-0.58	**-2.09**
Kuwait	-0.11	-1.30	-0.82	**-7.68**	-0.54	-1.22	0.25	1.16	0.40	-1.65	0.68	**-4.14**	0.39	**4.67**	0.10	**2.47**	-0.31	**-2.22**
Lithuania	-0.40	-1.85	-0.44	-1.07	-0.49	-1.27	-0.53	-1.88	-0.58	-1.89	-0.62	-1.83	-0.67	-1.31	-0.71	-0.42	-0.76	-1.46
Mauritius	-0.17	**-7.35**	-0.19	-1.60	-0.20	-0.52	0.22	1.55	0.24	-0.03	0.25	**-2.41**	-0.27	**-2.55**	0.28	**2.18**	-0.30	**-9.20**
Morocco	-0.35	-1.44	-0.84	-1.09	-0.39	-1.82	0.20	0.17	-0.08	-1.31	0.16	**-9.28**	0.24	**2.88**	0.32	1.79	-0.40	1.88
Nigeria	0.40	**2.84**	-0.39	-1.83	0.08	1.02	0.17	0.89	-0.26	-0.50	0.35	-1.61	0.44	**17.25**	-0.53	-1.94	-0.63	1.04
Oman	-0.46	**-2.24**	-0.45	**-2.17**	-0.05	-1.17	-0.95	-1.60	-0.44	**-2.79**	-0.29	**-2.35**	0.44	**2.72**	-0.43	-1.68	-0.43	**-5.20**
Pakistan	-0.42	**-2.23**	-0.59	**-2.70**	-0.28	-1.52	-0.92	-1.27	-0.09	**-1.98**	-0.26	**-89.25**	0.43	**29.78**	-0.59	**-2.49**	-0.76	**-34.67**
Romania	-0.07	**-4.08**	-0.51	**-3.24**	-0.21	-1.81	-0.39	-1.99	-0.83	-1.21	-0.27	-1.48	0.71	**2.48**	-0.15	-1.28	-0.59	-1.74
Serbia	0.32	1.43	-0.89	-1.68	-0.06	-1.11	-0.03	-1.66	-0.60	-1.45	-0.17	**-5.27**	-0.74	-1.60	-0.31	-1.58	-0.88	-1.18
Slovenia	0.56	**2.78**	-0.26	-1.32	-0.30	-1.06	-0.66	-0.27	-0.37	-1.69	-0.07	-1.31	-0.77	-1.21	-0.47	-1.89	-0.17	-1.62
Sri Lanka	0.80	**3.12**	-0.24	**-2.06**	0.47	1.36	-0.30	-1.04	-0.13	**-2.93**	-0.40	**-2.22**	-0.80	**-2.80**	-0.63	**-51.89**	-0.46	**-5.07**
Tunisia	-0.89	-1.47	-0.34	-1.19	-0.18	-1.61	-0.73	-1.71	-0.68	-0.96	-0.63	**-2.62**	0.57	**5.14**	0.52	**2.34**	-0.47	**-2.33**
Vietnam	0.26	**5.17**	-0.12	**-2.73**	-0.19	**-2.01**	-0.26	-1.38	-0.33	-1.35	-0.40	**-2.09**	-0.47	-1.46	-0.54	**-2.06**	-0.21	**-5.13**

Table 2 presents summarized results of Fama and MacBeth (1973) regressions of industry portfolio returns on macroeconomic risk factors. The abbreviations AGR stands for agricultural commodity Index, UCC is United States consumer confidence index, GTP is global term premium, GDS is global default spread, MTL is metal index, GI is global stock market return index, OIL is the changes in brent crude oil, TW$ is US trade-weighted exchange rates index, while VIX is the US volatility index. λ is the price of risk for global macroeconomic factors in each of the Frontier Equity markets included in the study. Standard errors and $t-$statistics are calculated using the Newey and West (1987) adjustment with six lags. $t-$statistics above the 5% (1%) critical level are in bold and italics

The average beta coefficient associated with the agricultural commodity index AGR ($\lambda_A GR$) is statistically significant in 14 Frontier Equity markets. Results in Table 1 indicate that the average beta coefficient of the agricultural commodity index in developed equity markets is statistically indistinguishable from zero, hence not priced and unable to command reasonable risk premium in Bangladesh, Kuwait, Lithuania, Morocco, Serbia, and Tunisia. It should be noted that most of the countries in the Frontier and emerging equity markets in this study are major producers of agricultural commodities, and hence commodities contribute significantly to the trading and economic earnings. Countries such as Sri Lanka, Kenya, and Argentina, are significant producers of soybeans, beef rice, coffee, tea, and a range of horticultural products which are important earners to their overall economic coffers. It is, therefore, explicable that these countries' broad returns-generating processes are highly driven by variations in the agricultural commodity index.

6. Robustness Analysis

To ascertain the robustness of the results presented in this study, generalised method of moments (GMM) is employed on a pooled sample of all the countries included in the study. This is done to establish the efficacy of the variables found to command significant risk premiums priced in different fronter equity markets. In less developed markets, due to a lack of sufficient data, pooling techniques are often favoured to allow diversification in constructing asset pricing factors and test portfolios (Boamah, 2017; Zaremba and Maydybura, 2019; Zaremba and Umutlu, 2018).

It is imperative to interrogate the results presented in Table 3 based on model stability and fitness. GMM estimation is generally plagued with either overfitting or underfitting the instruments (Baum et al., 2003). J-statistics and associated p-values as presented in Table 3 are used to test the hypothesis of the overidentification of the instruments. J-stat of 2.944 with p- values of 0.363 for the entire sample period fail to reject the null hypothesis of correct model specification. Results presented in the last two columns in Table 3 are further consistent, and thus the null hypothesis prevails.

Results in Table 3 do not deviate considerably from the counterparts reported in Tables 1 and 2. Table 3 reports that AGR is insignificant in determining return variations in a pooled sample of frontier equity markets. Despite largely confirming the results in Table (s) 1 and 2, GMM results

Table 3. GMM estimation of Risk Premiums in a Pooled sample of Frontier Markets

	β_i	t −stat	λ_i	t −stat
DEI	0.228	1.674	0.17	1.878
UI	0.019	**2.528**	0.09	**2.905**
LIQ	-0.008	**-2.772**	-0.119	**-1.996**
ROL	0.046	**0.822**	0.029	1.198
VOL	-0.049	**-2.606**	-0.043	**-2.66**
MS	0.042	0.692	0.253	1.297
AGR	0.056	1.307	-0.02	-1.585
CC	0.199	**2.155**	0.214	***3.672***
GTP	0.08	1.488	-0.057	**-1.991**
GDS	-0.368	**2.493**	0.017	***3.497***
GI	0.41	1.88	0.008	**2.067**
OIL	0.329	**2.172**	0.016	1.74
TW$	-0.118	-1.965	-0.002	**-2.299**
VX	-0.462	-1.871	-0.185	**-2.742**
Adj-R2	0.377		0.305	
RMSE	0.099		0.053	
J-stat	2.944		1.031	
P-Value	0.363		0.486	

This table presents summarized results of GMM regressions of EW portfolio returns on candidate risk factors in frontier equity markets. β_i is the coefficients associated with the factor i constructed on macroeconomic variables, while λ_i is the coefficient associated with the beta of each factors in the analysis. λ_i is the price of risk or the coefficient of the beta. Evaluated factor candidates DEI (changes in expected inflation factor), UI (unanticipated inflation), LIQ (aggregate liquidity), ROL (Rule of Law), VOL (aggregate volatility), MS (money supply), AGR (agricultural commodity index), CC (US consumer confidence index), GTP (global term premium), GDS (global default spread), GI (global market index proxied by MSCI index), OIL (return of Brent crude oil prices) and TW$ (trade weight US dollar exchange rates. The sample period covers the whole the period from January 1996 to February 2020. Standard errors and t −statistics are calculated using the Newey and West (1987) adjustment with six lags. t −statistics above the 5% (1%) critical level are in bold and italics

in Table 3 present smaller t-statistic across the significant factors in both emerging and developed markets. J-statistics and their associated p-values indicate that the models were optimally identified, fitted, and the right instruments were used to determine the moment conditions of the model.

7. Conclusion and Policy Implication

Asset pricing has attracted innumerable attention from many stakeholders in capital markets. However, there is still a considerable lack of consensus regarding the full list and identity of risk factors and even the ability of the already studied risk factors to optimally price risk in stock markets across the globe. This problem as highlighted in this study is more pronounced in the Frontier equity markets due to the unpredictability of the underlying risk fundamentals.

This study sought to investigate if the macroeconomic variables account for significant risk premiums in Frontier equity markets. At the individual country level, the results are mixed. However, a pooled sample of all the 20 markets in the sample reveals the existence of some commonalities among both domestic and global macroeconomic factors. The empirical evaluation using both Fama and MacBeth (1973) two-step and GMM regression procedures established that unanticipated inflation (UI), market-wide volatility (VOL), market liquidity (LIQ), consumer confidence index (CC), trade-weighted US dollar exchange rates (TW$) and VIX volatility index (VX) were not only significant drivers of risk variations but also priced in the returns of frontier equity markets.

A few underlying policy implications can be drawn from this study. First, given the increased investor attention to frontier equity markets, it is plausible that a favourable policy environment can accelerate capital market development and investment in these countries. On the contrary, a few pieces of literature highlight that the policy positions of many countries are at the core of derailing investment, development, and research. For instance, judicious implementation of asset pricing studies has consistently been met with substantial obstacles across the world in the presence of certain policy impediments instituted by authorities to safeguard interests. These include foreign exchange controls, and capital controls instituted to shield financial sectors and by extension capital markets from adverse external pressures.

In this study, some of the global macroeconomic variables investigated did not provide a significant influence on risk-return relations despite a plethora of evidence suggesting their impact on stock returns in other countries. For instance, excess returns of the global equity index proxied by excess returns of MSCI did not seem to significantly influence returns in the frontier equity markets in the study. Pasricha et al. (2018) highlight that possible explanations can be ascribed to the lack of capital markets integration, while Chinn and Ito (2006) cite poor or lack of capital markets integration as a symptom of capital control measures common in many frontier countries. Similarly, despite the reported impact of the global industrial production index proxied by the OECD industrial production index on the return-generating process in many countries across the world, see for example Gjerde and Saettem (1999) and Atanasov (2018), the variable could not be included in this study due to lack of or poor relationship (results excluded) with returns in frontier equity markets.

The lack of well-established debt (bond) markets in frontier economies also features prominently as a besetting drawback to investment and development of their capital markets. In such countries, capital is largely raised through the inadequate banking system which limits the amount of capital available for both private and public sectors. As argued by Ojah and Kodongo (2015) this may have undesirable consequences on financing projects that require large capital outlay like railway development, and building of large physical infrastructures which literature generally tie to the overall development of the economy. In developed and emerging markets, debt variables such as corporate bonds and government bonds form a significant component of capital market investment and are important drivers of returns in their stock markets. Unfortunately, frontier equity markets do not have well-functioning debt markets rendering the variables irrelevant in their risk-return equation. Thus, these countries should institute deliberate policy measures to ensure the growth of debt markets.

Biography

Wycliffe Nduga Ouma is a highly motivated and ambitious expert generalist with a Ph.D. in Financial Economics from Wits Business School. Currently serving as a Research Associate and Manager of the Research Portfolio at The Centre on African Philanthropy and Social Investment (CAPSI), located at Wits Business School, Nduga's research interests encompass sustainable finance and investment, social impact investing, socio-economic development, corporate philanthropy, financial risk modelling, asset pricing, international trade, green financing, just transition, project finance, and challenges in incorporating ESG into investment decision-making. With a focus on advancing sustainable and responsible business practices, promoting social and environmental sustainability, and ensuring inclusive and equitable economic development, Nduga is actively involved in research projects, provides strategic advice, and supervises research projects for MBA students. His work positions him as a thought leader and valuable contributor to the academic and business communities, reflecting his commitment to fostering positive change.

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Appendix A: Description of Macroeconomic Variables and Factors Construction

Variable Name	Literature Source	Factor Description	Factor Abbreviation
Expected Inflation	Chen et al. (1986)	Change in expected inflation. Expected inflation is the difference between the return on real interest rates or realised earnings from the 3-month treasury bill rate and the rate of inflation. $DEI_t = r_{f,t} - r_{i,t}\|t-1$ and $r_{i,t} = r_{f,t} - I_t.r_{f,t}$ is the real interest rates, $r_{i,t}$ is the real return on treasury bills.	DEI
Unanticipated Inflation	Chen et al. (1986)	The difference between realised inflation and expected inflation	UI
Aggregate Liquidity	Pástor and Stambaugh (2003)	The cross-sectional monthly average of individual-stock liquidity in a country weighted by the average GDP per capita in U.S dollars	LIQ
Regulatory Quality	Nguyen et al. (2019)	According to World Bank Governance Indicators, "Regulatory Quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development…"	REQ
Rule of Law	Nguyen et al. (2019)	Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	ROL
Broad Market Volatility	Syriopoulos, Makram, and Boubaker (2015)	Calculated from each country's stock market index returns or leading index using GARCH (11) process.	VOL
Money Supply (M2)	Abbas et al. (2019)	Change in M2 money supply	MS
Agricultural Commodity Index	Baldi et al. (2016)	SandP Agriculture; the benchmark for performance in the global agriculture commodity market	AGR
The US. Consumer Confidence Index	Bildirici and Badur (2019)	A survey of U.S consumers' opinions on current conditions and future expectations of the economy.	CC

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Variable Name	Literature Source	Factor Description	Factor Abbreviation
Global Term Premium	Chen et al. (1986) and Cooper et al. (2019)	The spread between U.S GDP-weighted yield of the ten-year bond and the one-year Treasury bonds yield	GTP
Global default Spread	Chen et al. (1986) and Cooper et al. (2019)	The yield spread between Moody's Baa and Aaa corporate bonds	GDS
Metal Index	(Jordan et al., 2016, 2018)	Industrial metals trading data from London Metal Exchange.	MTL
Global Stock Index (MSCI)	Al Nasser and Hajilee (2016)	MSCI index is used to mimic the global stock market index. The index is used to evaluate the integration and co-movement of the markets investigated with the global markets	GI
Crude Oil Prices	Bildirici and Badur (2019) and Bai and Koong (2018)	Closing prices of Brent crude oil (in Dollars per Barrel) on the New York Mercantile Exchange (NYMEX)	OIL
US$	Trade Weighted Exchange Rates	Bai and Koong (2018)	Measure trading activities between the US and some of the countries included in this study. According to Thomson Reuters DataStream (the source),; "The other important trading partners (OITP) index is a weighted average of the foreign exchange values of the U.S. dollar against a subset of currencies in the broad index that does not circulate widely outside the country of issue. The index weights, which change over time, are derived from U.S. export shares and from U.S. and foreign import shares. Currencies included in the OITP index are the Mexican peso, Chinese yuan, New Taiwanese dollar, Korean won, Singapore dollar, Hong Kong dollar, Malaysian ringgit, Brazilian real, Thai baht, Philippine peso, Indonesian rupiah, Indian rupee, Israeli new shekel, Saudi riyal, Russian ruble, Argentine austral, Venezuelan bolivar, Chilean peso and Colombian peso"

Appendix A: Description of Macroeconomic Variables and Factors Construction

Variable Name	Literature Source	Factor Description	Factor Abbreviation
TW$			
SandP Volatility Index (VIX)	Qadan, Kliger, and Chen (2019)	The aggregate global market volatility risk proxied by the VIX index. The Index is calculated by the Chicago Board Options Exchange (CBOE)	VX