# MODELING COST OF LIVING IN ADVOCACY FOR CHANGE IN AFRICA

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Abstract

In the past few months African countries have witnessed a lot of strife. This has been attributed to dissatisfaction among citizens. This paper endeavors to model the cost of this unrest on the ways of life of its citizens. A real risk weighted pricing model is used which determines actual risks and costs of the unrest with these estimates. It is hoped that the citizens will strive to change their mode of participation in their countries affairs and awaken political and economical development in Africa.

Key Words: Equity; Strife; Diversifiable risk: Non – Diversifiable risk

## 1 Introduction

In referring to Africa as the sleeping continent many scholars believe that it has the potential to be the richest continent. This could only be achievable if the vast resources in Africa are used by all citizens for their intended purpose economically. Over the years many African countries have experienced unrest most of this being due to poor leadership and economical malfunctions. In most cases these leaders are elected by citizens on sect oral or ethnic basis. The latest cases include Ivory cost a relatively politically and economically stable country in the recent past disintegrating into a lawless and unproductive Nation within a matter of days due to a political impasse. The other cases are the North African countries experiencing leadership changes at the expense of enormous strife and political melt down. The practice in the developed countries is to elect leaders with integrity and excellent track records.

The international community has decided that it must help restore stability in Africa by promoting negotiations, providing peacekeepers to monitor the implementation of agreements, and shoring up and reconstructing crumbling states. This policy has assisted to some extent but commitment of resources has not matched the rhetoric, and international intervention has not

been sufficient to bring any African conflicts to an end. International intervention, however, has been sufficient to prevent conflicts from ending the way most conflicts do: through the victory of one side. The current policy of the international community does not help populations and does not even help the international community. The reputation of the United Nations is becoming seriously tarnished by its African failures.

The major source of conflict in Africa at present is the political and economic decay of a growing number of postcolonial states. Political decay has created a power vacuum in many governments that have only nominal control over their territories and little power over means of coercion. Economic decay has worsened the situation because, in the absence of a viable legal-administrative structure, violence is the only way of securing access to resources. The major conflicts in Africa involve diamond-rich countries. Economic decay also provides the warring factions with an endless supply of fighters, including child-soldiers who see few other career prospects in war-torn nations. The lone exception to this scenario of decay-induced conflict is the war between Ethiopia and Eritrea, which stems from the two countries' ambition to build strong states; in other words, theirs is a classic war between states vying for power and economic advantage.

This paper intends to quantify the cost of these conflicts in the past six months as many findings in the African conflicts give a qualitative analysis and thus qualitative solutions. It also seeks to convince citizens that there is no individual who gains during a conflict, that is, conflicts result in loss – loss scenario. It is hoped that this study will be a stepping stone for conflict resolution exercises.

## 2 Literature Review

The costs of these happenings can be estimated using various methods. Recent developments include asset-liability management techniques (Panjer, 1998), methodologies to allocate equity capital by line of business for example ( Myers and Read, 2001), market-based project evaluation techniques such as risk-adjusted return on capital (RAROC), and the project introduction of fair value accounting for insurer liabilities (Girard, 2002; Dickinson, 2003). The use of an incorrect cost of capital in capital budgeting, pricing, and other applications can have serious consequences, with the firm losing market value if the cost of capital is underestimated and market share if the cost of capital is over estimated. Essentially using incorrect cost of capital estimates can lead to the firm's investing in negative net present value projects that destroy firm value. Dividend Growth Model a cost estimation method as determined by Gordon *et al, (*1990) works best in an unchanging environment where inflation remains level, the firm grows steadily, and the economy expands slowly. If inflation accelerates suddenly, the economy enters a recession or the firm's book of business changes rapidly, then the Dividend Growth model may not provide reasonable forecasts, as determined by, Weston *et al* (1986). Consider the effects of inflation which are rampant in times of civil unrest. If inflation accelerates and investors seek the same return in inflation - adjusted currencies, then the nominal cost of equity capital will rise but so will the nominal costs of other financial instruments, such as the coupon rate on bonds, or the mortgage rate on home loans.

Few pricing actuaries try to forecast future inflation or economic conditions. Instead they seek a relationship between the cost of equity capital and some steady and accessible index. The

Capital Asset Pricing Model (CAPM) provides such a relationship. In a recent survey Bruner *et a l* (1998) found that the most common method favoured by practitioners for doing this is the Capital Asset Pricing Model. According to CAPM the expected return on any asset is equal to the risk free rate plus a risk premium. To obtain beta estimates for individual stocks, starting in 1970, the following equation was estimated for each stock:

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{pr,t} - r_{ft}) + \varepsilon_t$$

where $r_{it}$ is the return on the stock, $r_{pr,t}$ the return on the index (proxy), and $r_{ft}$ the monthly return on three month Treasury Bills. Jan *et al* has shown that the standard procedure of using independent estimates of beta and the expected market risk premium to obtain an estimate for cost of equity based on CAPM most likely yields a biased estimate. This is undesirable since it leads to misallocation of funds and biased performance measures.

All the models used above and most other use betas or standard deviation to represent systematic risk. These are determined as asset covariance or error terms. The actual definition of non – diversifiable risk i.e. the risk that still exists in all well diversified portfolio postulates that it is one which cannot be diversified thus has an element of independence. Using an asset covariance or error terms to represent this risk goes against this phenomenon since these incorporate the dependency factor. Also the weight in the other models is a fraction of the total returns. This paper uses A Real Risk Weighed Pricing Model derived by Anyika *et al* where non – diversifiable risk is determined according to its real definition and is weighed against diversifiable risk and expected returns to determine the maximum returns at minimum risk. Even with limited data the model has an almost perfect correlation between the estimated and actual values.

**3 Cost of Equity**

The cost of equity has been estimated using the Real Risk Weighed Pricing Model

Let the weighted expected returns also called Cost of equity be given by

$$C\left(R_{l_w}\right) = d_{l_w} + f_{l_w} C\left(R_m\right) \tag{1}$$

Where, $d_{l_w} = \sum_{i=1}^{\infty} w_i d_i$, $f_{l_w} = \sum_{i=1}^{\infty} w_i f_i$, $w_i$ is the weight of security $i$, $d$ is the constant return unique to security $i$, $f_i$ is a measure of the sensitivity of the return of security $i$ to the return on the market index, $C\left(R_{l_w}\right)$ is the weighted expected return of security $i$, $C\left(R_m\right)$ is the weighted expected return of the market index.

Then take weighted diversifiable risk to be

$$\sigma_{h_w} = \left(k_{l_w} + p_{l_w}\right)^{1/2} \tag{2}$$

and weighted non – diversifiable risk as

$$\sigma_{G_w} = \left(k_{l_w} + e_l\right)^{1/2} \tag{3}$$

Where, $k_{l_w} = \sum_{i=1}^{\infty} w_i^2 \sigma_i^2$, $p_{l_w} = 2\sum_{i=1}^{\infty}\sum_{\substack{i=1 \\ i\neq j}}^{\infty} w_i w_j \sigma_{ij}$, $e_l = \sum_{i=1}^{\infty} \sigma_{e_i}{}^2$, $\sigma_j{}^2$ is the variance of the market index, $\sigma_i^2$ variance of security $i$, $\sigma_{e_i}{}^2$ variance of random error of security $i$, $\sigma_{h_w}$ is the diversifiable risk, and $\sigma_{G_w}$ non-diversifiable risk. To find the weight of investment $i$ that will maximize expected returns and minimize total variance we apply the classical optimization method with no constraints. We thus differentiate the expression;

$$C\left(R_{l_w}\right) - k_{l_w} - p_{l_w} = d_{l_w} + f_{l_w} C\left(R_m\right) - k_{l_w} - p_{l_w} \tag{4}$$

With respect to $w_i$, and differentiate

$$2k_{l_w} + p_{l_w} + e_l \tag{5}$$

With respect to $w_i$, where $C\left(R_{l_w}\right) - k_{l_w} - p_{l_w}$ are maximum returns (derived by subtracting diversifiable portfolio variance from portfolio expected returns), and $2k_{l_w} + p_{l_w} + e_l$ is the total variance (derived by adding portfolio variance to non-diversifiable variance)

Equate the differentials of 11 to 12 to get the value of $w_i$,

$$d_{l_w} + C(R_m) f_l - 2k_{l_w} - 2p_{l_w} = 2k_{l_w} + 2p_{l_w} + 2k_{l_w} \tag{6}$$

$$-6k_{l_w} = 4p_{l_w} - d_{l_w} - C(R_m) f_l$$

$w_j$ is similarly derived.

Thus $w_j = -2\sum_{i=1}^{\infty}\sum_{j=1}^{\infty} x_i \sigma_{ij} / (3\sum_{j=1}^{\infty} \sigma_j{}^2)$ (7)

Replacing it in equation 6 gives the value of

$$w_i = 3\sum_{j=1}^{\infty} \sigma_j \left\{ \sum_{i=1}^{\infty} d_i + C\left(R_m\right) \sum_{i=1}^{\infty} f_i \right\} / \left( 18 \sum_{i=1}^{\infty}\sum_{j=1}^{\infty} \sigma_i^2 \sigma_j{}^2 - 8 \sum_{i=1}^{\infty}\sum_{j=1}^{\infty} \sigma_{ij}{}^2 \right) \tag{8}$$

For $i = 1$

$$w_1 = 3\sum_{j=1}^{\infty} \sigma_j \left\{ \sum_{i=1}^{\infty} d_1 + C\left(R_m\right) \sum_{i=1}^{\infty} f_1 \right\} / 18 \sum_{i=1}^{\infty}\sum_{j=1}^{\infty} \sigma_1^2 \sigma_j{}^2 - 8 \sum_{i=1}^{\infty}\sum_{j=1}^{\infty} \sigma_{1j}{}^2$$

Once these weights are determined, they are substituted in equation 1 to give the cost of equity and in both equations 2 and 3 to give minimum total risk.

## 4. Modeling cost of equity

Cost of equity as illustrated above is modeled using stock indices for the month of November 2010 through to April 2011 for a portfolio of 14 African Countries which are found in appendix I. These include areas where unrest has been experienced recently. The portfolio was used as a representative index of the African continent during the past six months that is from November 2010 to April 2011. The indices are varied against Kenyan market trade indices for the same period.

### 4.1 Results of varying African indices against Kenyan major market indicators from November 2010 to April 2011

***Table 1: A table of Parameters from the estimation of cost of equity of Africa***

| Parameters | November 2010 | April 2010 |
|---|---|---|
| $m_n$ | 0.9887843 | 24.41646 |
| $m_{n-1}$ | -0.004884 | -0.22516 |
| $se_n$ | 0.0077209 | 2.083056 |
| $se_{n-1}$ | 0.0081793 | 0.169583 |
| $r_2$ | 0.9993298 | 0.925872 |
| $se_y$ | 0.0283498 | 0.560414 |
| $F$ | 16400.848 | 137.3927 |
| $df$ | 11 | 11 |
| $ss_{reg}$ | 13.181516 | 43.1501 |
| $ss_{resid}$ | 0.0088408 | 3.454705 |

Where

$ss_{reg}$ = The regression sum of squares

$ss_{resid}$ = The residual sum of squares

$df$ = The degree of freedom

$F$ = The F statistics or the F- observed value.

$se_y$ = The standard error for the y estimate

$s_{e1}, s_{e2}, ..., s_{en}$ = The standard error values for the coefficients $m_1, m_2, ..., m_n$

$r_2$ = The coefficient of determination compares estimated and actual y-value

### 4.2 Cost of Equity, Non-Systemic risk and Systemic risk of Africa between

**November 2010 - April 2011**

***Table 2: Cost of Equity, Non-Systemic risk and Systemic risk of Africa between November 2010 April 2011***

| | November 2010 | April 2011 |
|---|---|---|
| Cost of Equity | 0 | - 0.23545 |
| Non-Systemic risk | 0.03432 | 69 |
| Systemic risk | 0.12374 | 69 |

The cost of equity for Africa was zero in November at the initial stages of conflict and unrest in the North African countries and the risks were relatively low. Six months down the line the African cost of equity has dropped to – 0.23545 and the risks are extremely high i.e. 69.

## 5 Conclusion

Conflict in Africa has gone on for such a long time. Even when citizens make gains from past conflicts i.e. from dictatorship to true democracy the leaders who come in with this promise renege on it after they have tasted power. Therefore all effort needs to be channeled towards advocacy of African citizens to change the qualities of a leader they look for in their leaders. It is in this vain that this paper has been undertaken. From the results of cost of equity in Table I it is clear that during periods of conflict cost of returns is never positive indicated by the two values which are zero and - 2.3. These two costs also indicate that the costs increase drastically over a short period. The risks during these periods increase rapidly indicting that it is very risky to invest funds at these periods of conflict since the likely returns would be negative.

The $r$ value for estimating the cost of equity averages 96 percent. This is higher than Fama et al (1997) despite the fact that the data used is very minimal. RRWPM is thus a very dependable model and it is not degenerated by limited data or adverse economical conditions and conflict. A lot of research on conflict is in most cases analysed qualitatively. This makes it difficult to project future happenings in the conflict areas since there is no past or current data thus it is difficult to objectively quantify the conflicts. Many a times it is just assumed that conflict or civil strife impacts negatively on individuals' life. In most cases this is true but it is important to convince victims of this unrest beyond doubt that this is so. To this end this paper quantifies cost of these conflicts not only in one area but as a portfolio of a whole continent enabling advocacy for change all over the continent justifiable. It is hoped that if this is done frequently and communicated to the affected and unaffected areas will convince victims or the victims to be of the detriments of these unrest.

## 6 Recommendations

It would be of great significance if future cost of equity and its risks are determined so that past present and future costing parameters are accurately determined. Heads of states should create

enabling environments in their countries for their citizens to engage in healthy discussions on the various matters such as the constitutions, economical growth, equal opportunities, land etc. Citizen will thus feel part and parcel of the decision making process. This results in the satisfaction of citizens thus leading to improved economical performance.

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**APPENDIX I**

The $F$ and degrees of freedom ( $d_f$ ) values in output from tables I and II are used to access e. $F$ is compared with critical values in published $F$ -distribution tables. These tables have $v_1$ and $v_2$ degrees of freedom.

If n is the number of data points,

$v_1 = n - d_f$ and $v_2 = d_f$

For the November data $F$ = 16400.848, $d_f$ = 11and n = 16,

$v_1$ = 16 – 11–1 = 4 $v_2$ = 11 and assuming an alpha value of 0.05 then

FDIST (4, 11) = 1.11465 x $10^{-20}$

For the January data $F$ = 137.3937, $d_f$ = 11and $n$ = 16,

$v_1$= 16 – 11–1 = 4 $v_2$ = 11 and assuming an alpha value of 0.05 then

FDIST (4 ,11) = 2.60500 x $10^{-9}$

The critical levels of F for November data and January data are 1.11465 x $10^{-20}$

and 2.60500 x $10^{-9}$ respectively are much lower than their respective $F$ values from table I i.e.

16400.848 and 137.3937 respectively. Thus it is extremely unlikely that $F$ values this high occurred by chance.

**AppendixII**

**A sample of share indices representing the African Continent**

| Share Indicies | November 2010 | April 2011 |
|---|---|---|
| Kenya-NSE 20 Share Index | 4465 | 4029 |
| Nigeria- All Share | 26,831 | 25,042 |
| Zimbabwe-Industrial | 161 | 165 |
| Mauritius-Semdex | 2,024 | 2,063 |
| Zambia-All Share | 3,404 | 3,936 |
| Egypt-EGX 30 | 5,646 | 5,004 |
| South Africa-All Share | 31,399 | 32,836 |
| BRVM-Composite | 165 | 158 |
| Uganda -All Share | 1,213 | 1,226 |
| Tanzania -All Share | 1,174 | 1,185 |
| Ghana-GSE ALSI | 1,057 | 1,100 |
| Tunisia - TUNIS | 4334 | 4248 |
| Morocco - MORALSI | 12589 | 11582 |
| Malawi- All Share | 4,979 | 4,876 |

**Market Indicators in Kenya from November 2010 – April 2011**

| Market Indicator | November 2010 | April 2011 |
|---|---|---|
| NSE 20 Share Index | 3887.07 | 4029.23 |
| NSE All Share Index (NASI) | 89.50 | 94.18 |
| Market P/E Ratio | 11.32 | 11.69 |
| Market Capitalization (Kshs.Bn) | 1,090 | 1,155 |
| No. of issued shares (Billion) | 66.33 | 66.85 |
| No. of shares traded (Millions) | 469 | 497 |
| No. of equity transactions | 39,531 | 31,590 |
| Equity turnover (Kshs. Millions)-ET | 7,984 | 7,883 |
| Foreign turnover (FT) - Kshs. Bn | 4,900 | 5,182 |
| % foreign participation | 30.69 | 65.74 |
| Bond turnover (Kshs.Bn) | 40.12 | 33.38 |
| Bond deals | 614 | 463 |
| Kshs/US Dollar currency exchange | 82.99 | 83.42 |
| No. of trading days | 23 | 18 |