

The Comparative Performance of African Stock Markets: Nominal, Real and U.S. Dollar Returns

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ABSTRACT

This paper compares the performance of ten of the largest stock markets in Africa during the ten-year period, 1993 to 2002. The stock markets of Botswana, Egypt, Ghana, Kenya, Mauritius, Morocco, Nigeria, South Africa, Swaziland and Zimbabwe are compared with respect to their nominal local currency returns, inflation-adjusted local currency returns, and U.S. dollar returns. Performance is measured under two investment strategies. The lump-sum strategy uses the end-of-period values of equal beginning-of-period investments in the ten stock markets. Using this strategy we find that Zimbabwe's stock market had the greatest nominal return while Kenya's had the lowest return; Botswana's stock market had the best inflation-adjusted return while the stock market of Kenya had the worst return; and Zimbabwe's stock market had the best U.S. dollar performance while Swaziland's stock market had the worst U.S. dollar performance. The annuity strategy assumes equal annual investments in the stock markets. Using this strategy we find that Zimbabwe's stock market had the greatest nominal return while Kenya's had the lowest return; Botswana's stock market had the best inflation-adjusted return while the stock market of Kenya had the worst return; and Zimbabwe's stock market had the best U.S. dollar performance while Kenya's stock market had the worst U.S. dollar performance. This methodology leads to performance rankings which could be at variance with those obtained using average returns. The results of this analysis address the ability of these stock markets to function as wealth preservation and enhancement vehicles to local investors as well their ability to meet the needs of foreign portfolio investors.

JEL Classification: G1, O16

Keywords: African stock exchanges; Equity market performance; Emerging markets; Stock returns; Inflation; Portfolio investment

I. INTRODUCTION

The performance of equity markets is obviously important to investors. Equity market performance is also of interest to policymakers because stock indices are recognized as leading indicators of economic activity. The level of stock prices can also have a direct impact on consumption via the wealth effect.

Given the importance of stock markets, studies of their role in African economics are few and far between. Studies of the comparative performance of African stock markets are even rarer. This paper is an effort to fill the void in this area of study. We compare the performance of ten of the largest stock markets in Africa during the ten-year period, 1993 to 2002. The stock markets of Botswana, Egypt, Ghana, Kenya, Mauritius, Morocco, Nigeria, South Africa, Swaziland and Zimbabwe are compared with respect to their nominal local currency returns, inflation-adjusted local currency returns, and U.S. dollar returns.

A major goal of this study is to discover how well African stocks have performed as hedges against inflation. It is no secret that African nations have had some of the highest rates of inflation in the world over the past three decades. The relevance of equity securities in Africa depends to a large extent on the degree to which African stocks have ameliorated the impact of inflation on savers and investors.

There are several studies of common stocks as inflation hedges in developed economies. Since common stock represent ownership of real assets, their returns should be independent of the rate of inflation; this is the Fisher hypothesis. Thus, an increase in the rate of inflation should be reflected in an equal increase in the nominal return on stocks. Bodie (1976) and Nelson (1976) found, however, that stock returns were negatively correlated to both anticipated and unanticipated inflation in the United States.

This negative relationship between stock returns and inflation is not unique to the United States. Owusu-Frimpong (2001) found that Ghana's stock market performed poorly during periods of high inflation in the mid-1990s. A survey conducted by Owusu-Frimpong, indicated that "a large number of respondents are discouraged from trading on the GSE because of accelerating inflation which often leads to high risk and a low rate of return on investment" (p. 130). A study of three African countries by Nwokoma (2005), found a positive relationship between stock returns and inflation in Nigeria, but inconclusive results for Kenya and South Africa. Branch (1974) studied the performance of stocks as inflation hedges using data on 22 countries and found that "stocks appear to be a partial but not complete long-run inflation hedge" (p. 50). Another study of 26 countries by Gultekin (1983) found an unstable relationship between stock returns and inflation. However, Hess and Lee (1999) explained the puzzling empirical evidence on stock returns and inflation by introducing supply and demand shocks; while supply shocks generate a negative relationship between stock returns and inflation, demand shocks generate a positive relationship between stock returns and inflation. Some of these contradictory results are explained by the impact of inflation on the value of debt held by firms. Net debtor firms may provide better inflation hedges than net creditor firms. Ritter and Warr (2002) found evidence that investors tend to undervalue levered firms during inflationary periods because they don't fully adjust for the falling real value of their nominal liabilities.

In contrast to most studies, which employ statistical techniques to test the correlation between inflation and stock returns, this study uses two investment strategies—lump-sum and annuity—to investigate actual inflation-adjusted returns among the ten African stock markets. Our primary purpose is not to test the Fisher hypothesis in Africa but to discover the relative performance of African stock markets in protecting investors against inflation and encouraging the growth of savings and investment.

Section II of the paper presents the data and methodology. Sections III, IV and V, discuss nominal returns, real returns, and U.S. dollar returns, respectively. Section VI concludes the analysis.

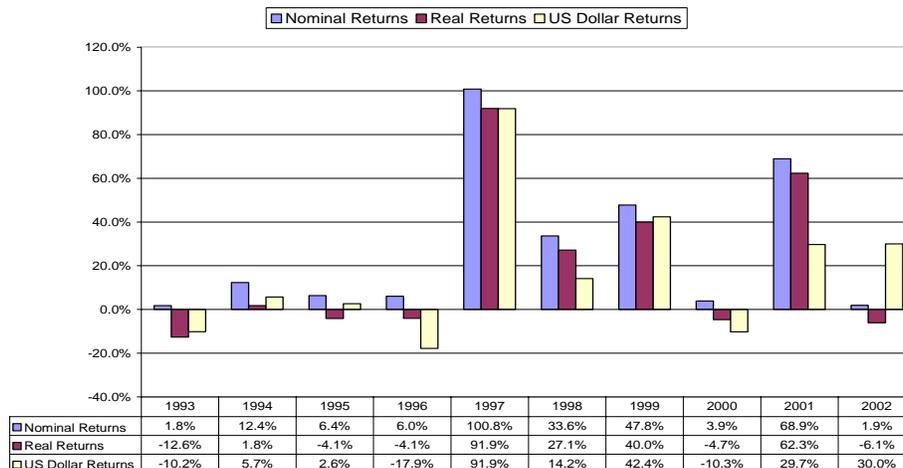
II. DATA AND METHODOLOGY

A. Data Sources

Data for this analysis were obtained from three primary sources. The values of the stock market indices were obtained from the United Nations Development Program's (UNDP) *African Stock Markets Handbook* (2003). The UNDP's handbook had data for eighteen African stock markets. However, only ten of these stock markets had index values for the years 1992 to 1993 which were required to compute returns for the 1993 to 2002 period under examination in this analysis.

Consumer price index (CPI) data were obtained from the International Monetary Fund while exchange rate data were obtained from the African Development Bank's *Selected Statistics* (2006). Graphical representations as well as numeric values of nominal returns, real returns and U.S. dollar returns are shown in Figures 1 through 10 for the ten stock markets.

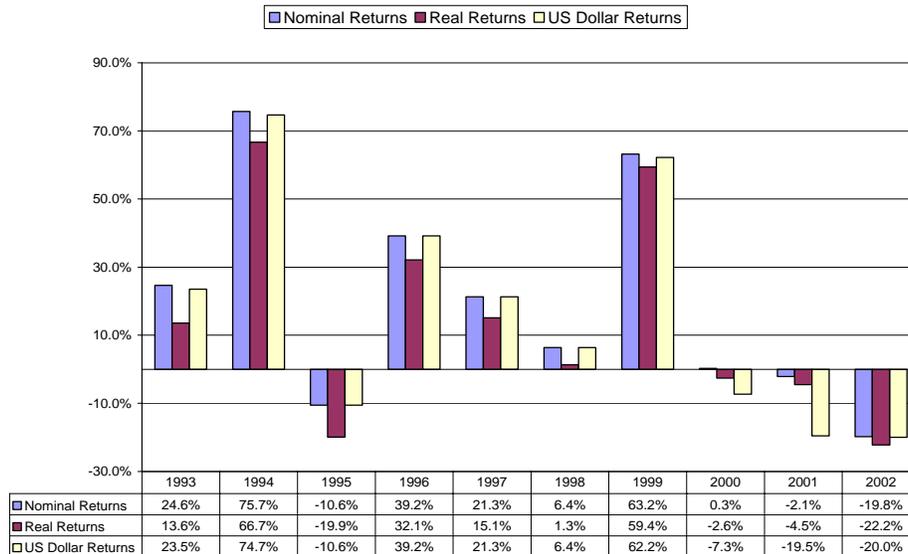
Figure 1
Botswana - BSE Domestic Index Returns



Botswana stock market performance was measured using the BSE Domestic Index. Figure 1 shows that nominal returns were positive throughout the study period. However, real returns were positive in five of the ten years while U.S. Dollar returns were positive in seven of the ten years under study. The highest nominal, real and U.S. Dollar returns were recorded in 1997.

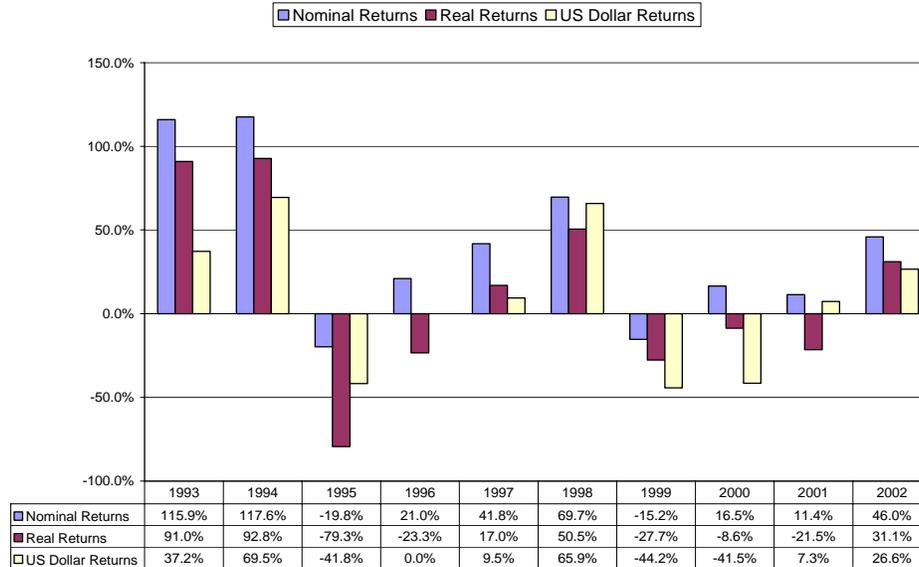
The CMA General Index was used to measure Egypt's stock market performance. Figure 2 shows that nominal returns were positive in seven of the ten years, while real and U.S. Dollar returns were positive in 6 years of the ten years. The highest nominal, real and U.S. Dollar returns were recorded in 1994.

Figure 2
Egypt - CMA General Index Returns



Ghana's stock market performance was measured using the GSE All Share Index. Figure 3 shows that nominal returns were positive during eight of the ten years. However, real returns were positive half the time, while U.S. Dollar returns were positive in seven of the ten years under study. As was the case with the Egyptian stock market, the highest nominal, real and U.S. Dollar returns were recorded in 1994.

Figure 3
Ghana - GSE All Share Index Returns



Kenya's stock market performance was measured using the NSE 20 Share Index. Figure 4 shows that nominal returns were positive in only three years, while real and U.S. Dollar returns were positive in only two of the ten years of the analysis. The highest nominal and real returns were achieved in 1993, while the highest U.S. Dollar returns were recorded in 1994. Interestingly, the NSE 20 Share Index turned in positive performances at the beginning of the period (1993 and 1994) and consistently negative performances thereafter. As such, the Kenyan pattern of returns did not experience the usual cycles, or *mean reversion*, evident in most stock markets.

The SEMDEX Index was used to measure Mauritius stock market's performance. Figure 5 shows that nominal returns were positive during six of the ten years of the study. However, real and U.S. Dollar returns were positive fifty percent of the time. As the highest nominal and real returns were achieved in 1993, while the highest U.S. Dollar returns were recorded in 1994.

The All Share Index was used to measure Morocco's stock market performance. Figure 6 shows that nominal returns were positive during the first six years and negative thereafter. Real returns were positive in five of the ten years while US Dollar returns were positive during the first six years of the analysis. As was the case in Botswana, the highest nominal, real and U.S. Dollar returns were recorded in 1997.

Figure 4
Kenya - NSE 20 Share Index Returns

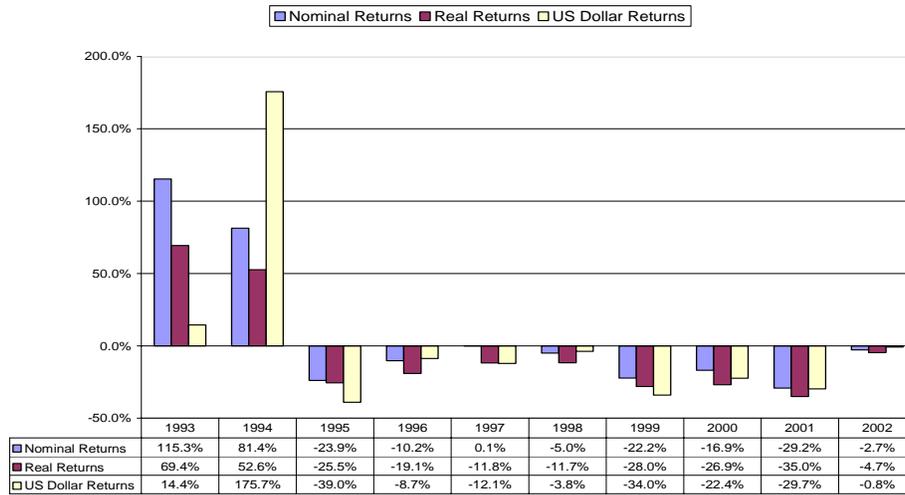


Figure 5
Mauritius - SEMDEX Index Returns

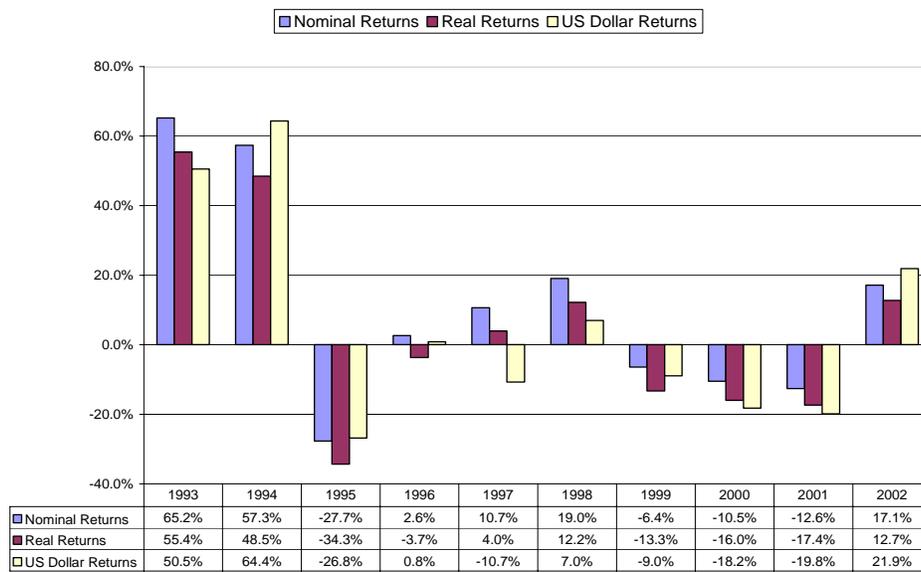


Figure 6
Morocco - All Share Index Returns

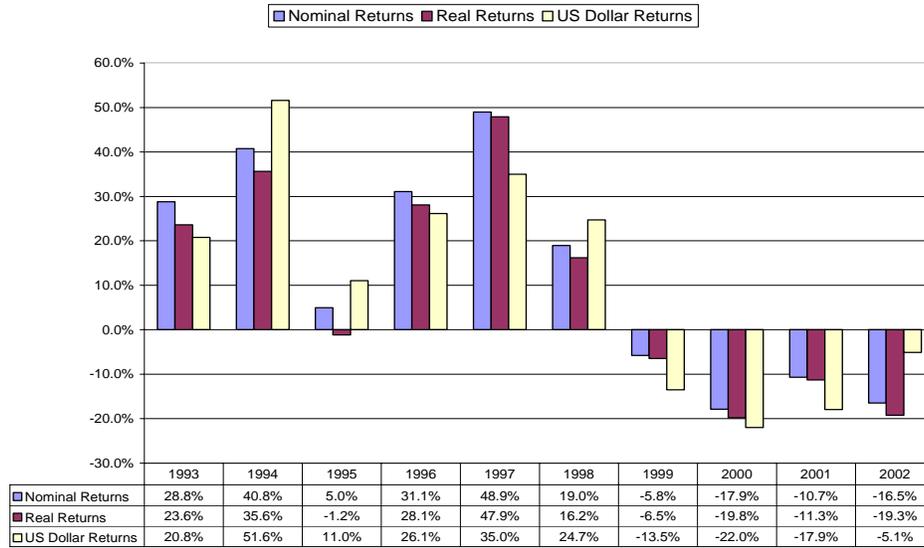
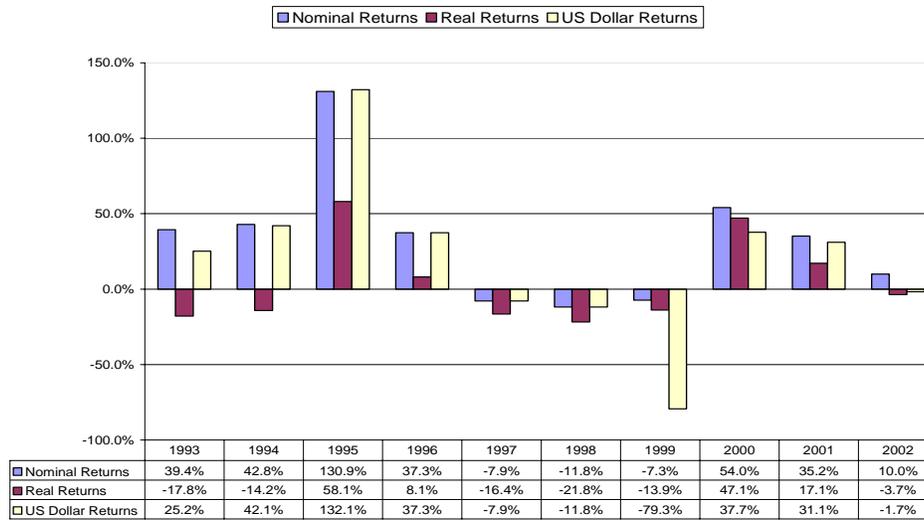


Figure 7
Nigeria - All Share Index Returns



Nigeria's stock market performance was measured using the All Share Index. Figure 7 shows that nominal returns were positive in seven of the ten years of the study. Real returns were positive in only four years, while U.S. Dollar returns were positive in six of the ten years of the analysis. The highest nominal, real and U.S. Dollar returns were achieved in 1995.

For South Africa, the JSE All Share index was employed. Figure 8 shows that nominal returns were positive in six of the ten years while real returns were positive in four of the ten years. U.S. Dollar returns were positive in five of the ten years of the analysis. The highest nominal, real and U.S. Dollar returns were recorded in 1999.

The SSX All Share Index was used to gauge Swaziland's stock market performance. As shown in figure 9, nominal returns were positive during seven of the ten years. However, real returns and U.S. Dollar returns were positive in only four years. The highest nominal, real and U.S. Dollar returns were recorded in 1996.

Finally, Zimbabwe's stock market performance was measured using the ZSE Industrial Index. Figure 10 shows that nominal returns were positive in eight of the ten years of the study. Real returns were positive in six of the ten years, while U.S. Dollar returns were positive in seven of the ten years of the analysis. The highest nominal and real returns were achieved in 1993, while the highest U.S. Dollar return was recorded in 2001.

Figure 8
South Africa - JSE All Share Index Returns

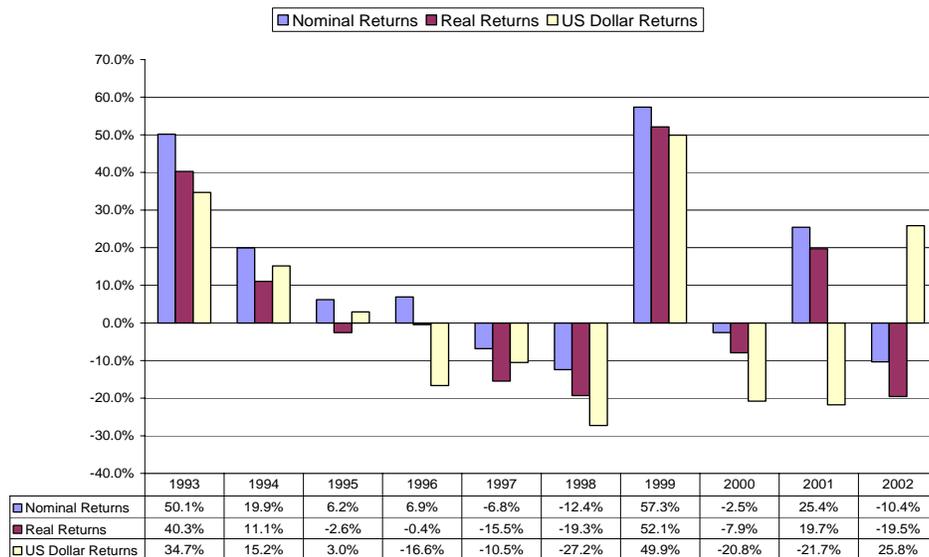


Figure 9
Swaziland - SSX All Share Index Returns

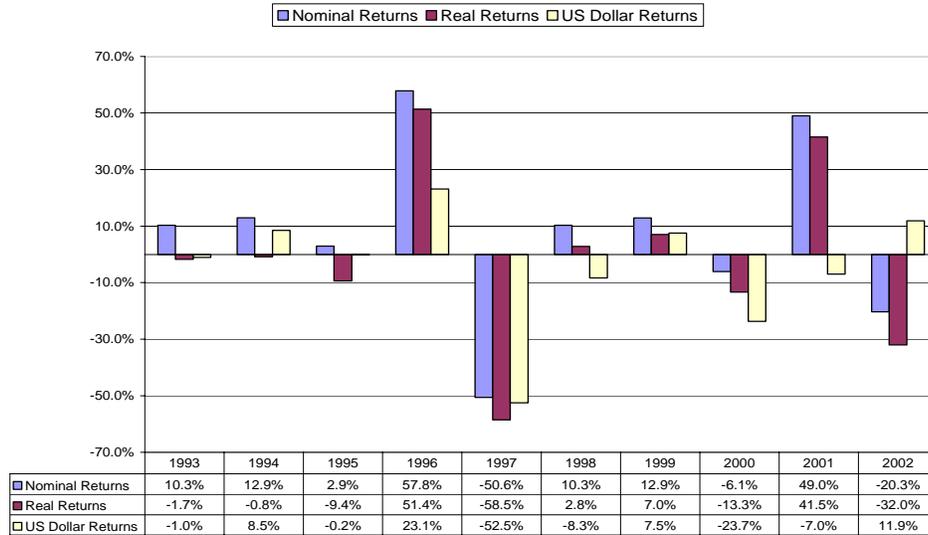
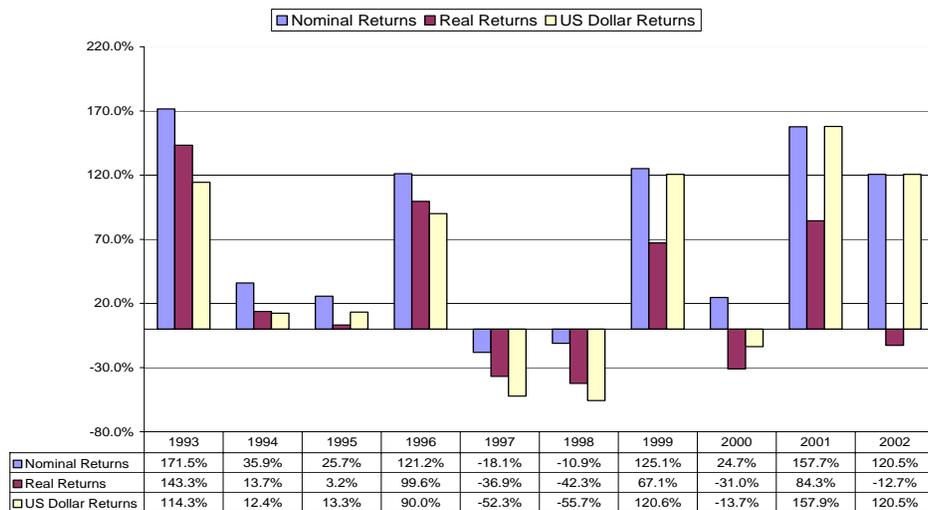


Figure 10
Zimbabwe - ZSE Industrial Index Returns



B. Lump-Sum Strategy

This strategy is essentially a buy-and-hold strategy, whereby an investor commits an initial sum of money to the equity market and waits a number of periods to realize some return without further cash flows between the initial investment and the end-of-period cash flow. This strategy measures how well African stock markets have performed as instruments of *wealth preservation*. This is an important question for many investors.

Under the lump-sum strategy, stock market returns are ranked by the value of the indices in 2002 relative to their values in 1992, assuming an initial investment of 100 units of local currency at the end of 1992¹. For nominal returns, the basic valuation equation is

$$SMI_t = SMI_{t-1}(1 + r_t) \quad (1)$$

where SMI_t represents the stock market index value at the end of period t and r_t represents the index's return in period t .

For the ten-year period we have

$$SMI_{2002} = SMI_{1992}(1 + r_{1993})(1 + r_{1994}) \dots (1 + r_{2002}) \quad (2)$$

with $SMI_{1992} = 100$.

Real and U.S. dollar returns are computed with the same basic methodology except that, for real returns, the indices are stated in constant 1992 currency units using the CPI data for each nation while U.S. dollar returns use the exchange rates to convert nominal returns to their U.S. dollar equivalents.

C. Annuity Strategy

As important as the markets' ability to preserve wealth is, the lump-sum strategy is not the only relevant measure of market performance in this analysis. An equally important measure of performance is more relevant to investors with a long time horizon who have the ability to augment the initial investment with periodic cash flows over the investment horizon. This we term the annuity strategy. It measures the markets' performance as instruments of *wealth accumulation* and would be of great interest to investors as well as retirement planners.

As was the case under the lump-sum strategy, the annuity strategy ranks stock market returns by the value of the indices in 2002 relative to their values in 1992, with an initial investment of 100 units of local currency at the end of 1992. However, the annuity strategy further assumes that equal annual investments of 100 units of local currency are made at the beginning of each year thereafter.

The future value of an annuity can be represented by the following equation

$$FVA_N = INV(1+r)^{N-1} + INV(1+r)^{N-2} + \dots + INV(1+r)^{N-N} \quad (3)$$

where INV is the equal period investment, N is the number of periods, and r is the periodic return. This formula generalizes to

$$FVA_N = \frac{(1+r)^N - 1}{r} \quad (4)$$

However, in our case, the rates of return vary by year and the future values of the annuities are computed manually using a spreadsheet program.

III. NOMINAL RETURNS

Table 1
Nominal performance of African stock markets

Lump-Sum Strategy												
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Rank
Botswana	100.0	101.8	114.3	121.6	128.9	258.9	346.0	511.3	531.1	897.1	913.9	4
Egypt	100.0	124.6	219.0	195.8	272.5	330.5	351.6	573.6	575.1	563.1	451.6	5
Ghana	100.0	215.9	469.9	376.9	456.1	646.9	1,097.9	930.7	1,084.7	1,208.6	1,764.0	2
Kenya	100.0	215.3	390.6	297.2	266.8	267.1	253.8	197.3	163.9	116.0	112.9	10
Mauritius	100.0	165.2	259.9	188.0	193.0	213.5	254.2	237.9	213.0	186.1	218.0	8
Morocco	100.0	128.8	181.3	190.3	249.4	371.5	441.9	416.4	341.9	305.4	255.1	7
Nigeria	100.0	139.4	199.1	459.7	631.3	581.5	512.8	475.5	732.3	989.8	1,088.8	3
South Africa	100.0	150.1	180.0	191.1	204.3	190.3	166.6	262.1	255.5	320.4	287.2	6
Swaziland	100.0	110.3	124.6	128.2	202.3	100.0	110.3	124.5	116.9	174.2	138.8	9
Zimbabwe	100.0	271.5	369.0	463.8	1,025.7	840.1	748.1	1,684.2	2,099.5	5,411.1	1,934.3	1
Median	100.0	144.8	209.0	193.5	258.1	298.8	348.8	445.9	436.5	441.7	369.4	

Annuity Strategy												
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Rank
Botswana	100.0	201.8	326.7	447.5	574.4	1,253.4	1,775.1	2,723.3	2,928.7	5,047.5	5,142.1	2
Egypt	100.0	224.6	494.7	542.4	854.8	1,136.8	1,309.2	2,236.0	2,341.9	2,392.7	1,919.1	5
Ghana	100.0	315.9	787.5	731.6	985.5	1,497.6	2,641.6	2,339.5	2,826.5	3,249.4	4,742.6	3
Kenya	100.0	315.3	672.0	611.3	648.7	749.4	812.1	731.4	707.7	601.0	584.5	10
Mauritius	100.0	265.2	517.2	474.2	586.6	749.1	991.8	1,028.1	1,020.5	991.8	1,161.6	8
Morocco	100.0	228.8	422.0	543.0	811.7	1,309.0	1,657.1	1,661.5	1,464.5	1,408.1	1,176.0	7
Nigeria	100.0	239.4	441.9	1,120.5	1,638.6	1,609.3	1,519.3	1,508.7	2,423.6	3,375.8	3,713.3	4
South Africa	100.0	250.1	399.9	524.5	660.7	715.5	726.5	1,242.9	1,311.3	1,744.5	1,563.6	6
Swaziland	100.0	210.3	337.5	447.4	806.0	498.3	649.7	833.2	882.5	1,415.1	1,127.7	9
Zimbabwe	100.0	371.5	604.9	860.3	2,002.7	1,740.3	1,649.8	3,813.9	4,854.5	12,611.	27,815.	1
Median	100.0	244.8	468.3	542.7	808.8	1,195.1	1,414.3	1,585.1	1,903.2	2,068.6	1,741.4	

Table 1 shows the nominal performance of the stock markets. Under the lump-sum strategy, Zimbabwe stock market ranks first, followed by the stock markets of Ghana, Nigeria, Botswana, Egypt, South Africa, Morocco, Mauritius, Swaziland and Kenya. One hundred units of local currency invested at the beginning of 1993 grow to 11,934.3 units in Zimbabwe; the same one hundred units grow to only 112.9 units in Kenya. Of course, a significant portion of this disparity is due to differing rates of inflation among the countries.

Table 1 also shows the nominal performance of the stock markets under the annuity strategy. The rankings are similar, but not identical, to those under the lump-sum strategy. Again, Zimbabwe's stock market is the best-performing while Kenya's turns in the worst performance. One thousand units of local currency invested, over a period of ten years, grows to 27,815.2 units in Zimbabwe; the same 1,000 units declines in value to 584.5 in Kenya, the only country with a loss of principal for the ten-year period. However, a number of countries change position in the rankings. For example, Botswana's stock market has the second-best performance under the annuity strategy versus the fourth-best under the lump-sum strategy and Ghana's ranking drops to 3rd from 2nd.

The ranking changes illustrate the importance of the *timing* of inflows under the annuity strategy. Botswana's stock market did not experience negative returns during any year between 1993 and 2002. In contrast, Ghana's stock market experienced a 19.8 percent decline in 1995 and a 15.2 percent decline in 1999. As such, even though the geometric average return on the Ghana stock market, at 33.2 percent, is significantly higher than Botswana's 24.8 percent, an investor in Botswana's BSE Domestic Index never had to suffer a loss during the period. Comparisons based solely on geometric average returns do not capture the importance of different *return trajectories* and the impact they can have on end-of-period wealth. One hundred units of local currency invested at the beginning of 1993 grow to 1,764 units in Ghana versus 913.9 units in Botswana. However, one hundred units of local currency invested at the beginning of every year for ten years (a total investment of 1,000 units) grows to 5,142.1 units in Botswana versus 4,742.6 units in Ghana, a difference of 7.8 percent. Thus, the volatility of returns can lead to significant differences in performance under the annuity strategy².

IV. REAL RETURNS

Of course, investors who are not under the influence of money illusion would care more about real returns than nominal returns. Rational investors would be concerned with the purchasing power of end-of-period wealth, even though the popular press tends to trumpet nominal returns.

Table 2 shows the inflation-adjusted (i.e., real) performance of the stock markets, using constant 1992 currency units to measure investment performance. Botswana's stock market had the best performance under the lump-sum strategy. An investment of 100 currency units at the beginning of 1993 grew to 405.6 units in real terms by 2002. Zimbabwe's performance was almost as impressive as Botswana's, with 100 currency units growing to 385.0 in the same period. Positive real returns were experienced by investors in Egypt, Morocco, South Africa, Mauritius and Nigeria. Investors in the stock markets of Ghana, Swaziland and Kenya were the only ones to have suffered declines in purchasing power during the 1993-2002 period, under the lump-sum

strategy. Figure 11 shows the relative real performance of the stock markets under the lump-sum strategy, with all stock markets indexed at 100 at the beginning of the analysis period.

Table 2
Real performance of African stock markets*

Lump-Sum Strategy												
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Rank
Botswana	100.0	87.4	88.9	85.2	81.7	156.8	199.4	279.1	266.1	432.0	405.6	1
Egypt	100.0	113.6	189.3	151.6	200.2	230.4	233.5	372.2	362.6	346.2	269.3	3
Ghana	100.0	191.0	368.1	76.3	58.5	68.5	103.1	74.5	68.1	53.5	70.1	8
Kenya	100.0	169.4	258.4	192.6	55.8	137.4	121.3	87.4	63.9	41.5	39.6	10
Mauritius	100.0	155.4	230.7	151.6	146.0	151.8	170.3	147.7	124.1	102.5	115.6	6
Morocco	100.0	123.6	167.6	165.7	212.2	313.9	364.8	341.2	273.6	242.7	196.0	4
Nigeria	100.0	82.2	70.5	111.5	120.5	100.7	78.8	67.8	99.7	116.8	112.5	7
South Africa	100.0	140.3	155.8	151.8	151.2	127.8	103.1	156.9	144.4	172.9	139.1	5
Swaziland	100.0	98.3	97.5	88.3	133.7	55.5	57.0	61.0	52.9	74.9	50.9	9
Zimbabwe	100.0	243.3	276.6	285.3	69.4	359.1	207.3	346.5	239.1	440.8	385.0	2
Median	100.0	131.9	178.5	151.6	148.6	144.6	145.8	152.3	134.3	144.9	127.4	

Annuity Strategy												
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Rank
Botswana	100.0	176.4	258.2	320.0	373.1	747.7	994.3	1,415.0	1,402.1	2,267.2	2,138.8	1
Egypt	100.0	202.3	408.5	409.6	602.8	755.0	827.8	1,362.8	1,387.8	1,384.3	1,084.0	2
Ghana	100.0	252.8	504.7	294.0	274.4	334.0	494.2	389.2	375.7	325.0	413.1	8
Kenya	100.0	216.0	357.4	320.1	312.1	322.1	327.1	278.6	245.1	196.8	187.7	10
Mauritius	100.0	241.5	432.8	372.0	432.9	518.2	642.2	623.0	586.1	543.7	610.1	6
Morocco	100.0	217.5	381.6	462.7	671.6	1,071.9	1,320.6	1,315.0	1,137.2	1,086.8	883.1	3
Nigeria	100.0	152.3	179.1	262.7	297.2	268.9	230.8	215.0	322.9	381.1	368.7	9
South Africa	100.0	227.7	334.5	403.5	473.6	472.2	448.6	729.5	730.4	919.3	754.7	5
Swaziland	100.0	187.7	264.8	312.6	529.2	303.1	367.6	445.3	439.9	656.3	468.2	7
Zimbabwe	100.0	289.8	386.1	448.2	857.9	627.3	452.8	662.6	541.9	811.9	767.9	4
Median	100.0	216.8	369.5	346.0	453.3	495.2	473.5	642.8	564.0	734.1	682.4	

* Constant 1992 currency units.

Figure 11
Real performance of African stock markets: lump-sum strategy

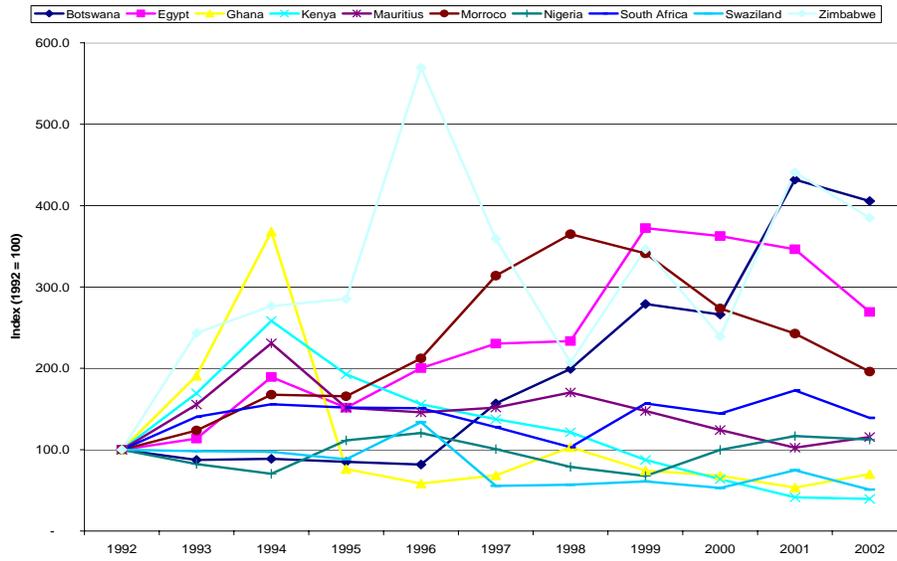
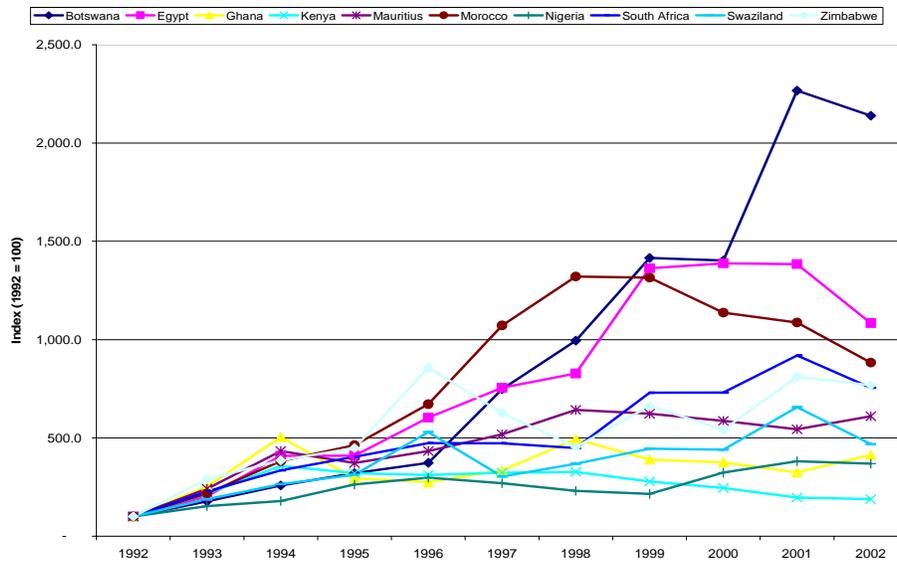


Figure 12
Real performance of African stock markets: annuity strategy



Again, Botswana turned in the best performance under the annuity strategy, followed by Egypt, Morocco, Zimbabwe, South Africa, Mauritius, Swaziland, Ghana, Nigeria and Kenya. Given that Kenya's NSE 20 share index was only 12.9% higher at the end of 2002 than at the beginning of 1993, its dismal real performance is not surprising. As was the case in the nominal return rankings, Kenya's stock market turned in the worst real performance, losing 60.4 percent in purchasing power under the lump-sum strategy and 81.2 percent under the annuity strategy. Figure 4 shows that Kenya's NSE 20 share index had positive real returns in 1993 and 1994. However, it experienced consistently negative real returns between 1995 and 2002. Figure 12 shows the relative real performance of the stock markets under the annuity strategy, with all stock markets indexed at 100 at the beginning of the ten-year period.

Table 3
US dollar performance of African stock markets

Lump-Sum Strategy												
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Rank
Botswana	100.0	89.8	95.0	97.4	80.0	153.5	175.3	249.6	223.9	290.5	377.6	2
Egypt	100.0	123.5	215.7	192.9	268.5	325.7	346.4	561.9	520.6	418.8	335.2	3
Ghana	100.0	137.2	232.5	135.4	135.4	148.2	245.9	137.1	80.2	86.0	108.9	7
Kenya	100.0	114.4	315.5	192.4	175.6	154.3	148.5	98.0	76.1	53.5	53.0	9
Mauritius	100.0	150.5	247.4	181.0	182.5	163.0	174.4	158.8	129.9	104.1	126.9	6
Morocco	100.0	120.8	183.1	203.3	256.5	346.2	431.9	373.5	291.4	239.1	227.0	4
Nigeria	100.0	125.2	177.8	412.7	566.7	522.0	460.4	95.4	131.4	172.2	169.3	5
South Africa	100.0	134.7	155.1	159.7	133.1	119.2	86.7	130.0	102.9	80.6	101.4	8
Swaziland	100.0	99.0	107.3	107.1	131.9	62.6	57.4	61.7	47.1	43.8	49.0	10
Zimbabwe	100.0	214.3	241.0	273.0	518.5	247.4	109.7	242.0	208.9	538.8	1,188.2	1
Median	100.0	124.3	199.4	186.7	179.1	158.7	174.8	147.9	130.6	138.2	148.1	
Annuity Strategy												
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Rank
Botswana	100.0	178.1	271.4	358.6	356.6	743.5	899.5	1,329.3	1,234.9	1,634.3	2,124.5	2
Egypt	100.0	222.6	487.4	534.4	842.2	1,120.0	1,289.9	2,190.1	2,119.8	1,779.9	1,424.4	3
Ghana	100.0	200.7	389.7	262.9	292.6	343.2	591.6	344.7	208.9	231.1	292.7	9
Kenya	100.0	167.6	542.8	395.8	427.1	433.1	475.1	363.3	328.4	276.9	274.7	10
Mauritius	100.0	241.6	492.3	456.5	554.9	571.8	680.4	686.2	622.2	554.8	676.3	5
Morocco	100.0	214.6	426.3	580.2	834.8	1,220.1	1,619.6	1,490.3	1,248.0	1,102.4	1,046.5	4
Nigeria	100.0	215.0	394.7	1,005.9	1,470.9	1,444.7	1,363.9	302.7	434.7	587.3	577.3	6
South Africa	100.0	224.4	344.6	438.3	430.6	448.1	378.1	616.4	528.3	438.7	552.0	7
Swaziland	100.0	188.7	290.8	373.8	525.3	312.1	338.2	413.2	355.5	355.8	398.1	8
Zimbabwe	100.0	293.3	395.1	506.4	1,012.4	512.5	241.9	548.0	483.1	1,255.7	2,769.4	1
Median	100.0	214.8	394.9	447.4	540.1	542.2	636.0	582.2	505.7	571.0	626.8	

V. U.S. DOLLAR RETURNS

Given the difficulty of obtaining reliable and timely inflation data, the currency of a country with relatively low inflation rates can be used as a proxy for the real performance of international stock markets. Although not a perfect substitute for proper inflation adjustments, the U.S. dollar often serves as a second-best metric. The U.S. dollar performance of emerging equity markets is also of interest to a host of portfolio managers whose performance is judged in dollar terms.

Table 3 shows the computed U.S. dollar returns. Overall, the ten African stock markets performed quite well during the 1993-2002 period in dollar terms, with a median increase of 48.1 percent under the lump-sum strategy. Zimbabwe turned in the best performance in dollar terms while Swaziland turned in the worst performance; Swaziland and Kenya were the only two stock markets where investments lost value under the lump-sum strategy. The performance rankings are similar under the annuity strategy. Figures 13 and 14 show the U.S. dollar performance of the stock markets under the lump-sum and annuity strategies, respectively.

Figure 13
US dollar performance of African stock markets: lump-sum strategy

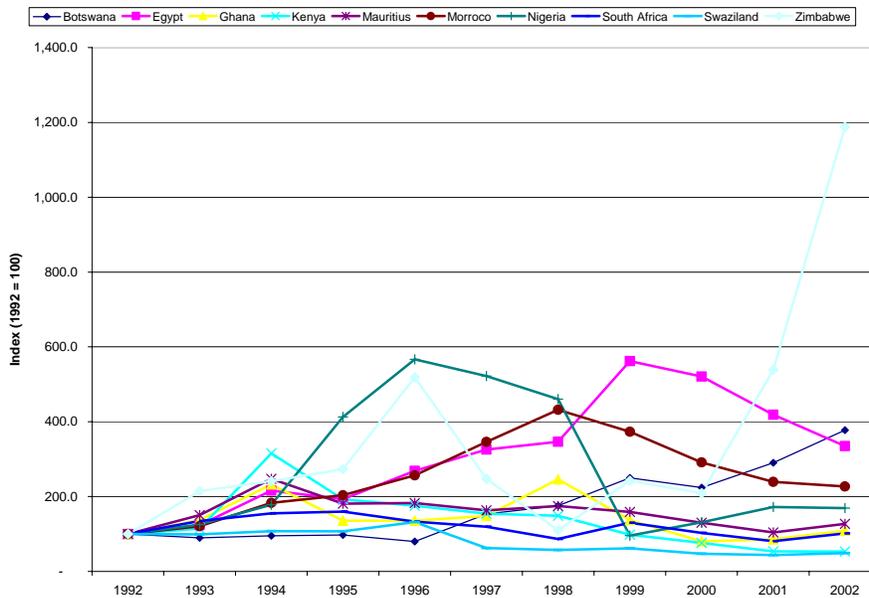
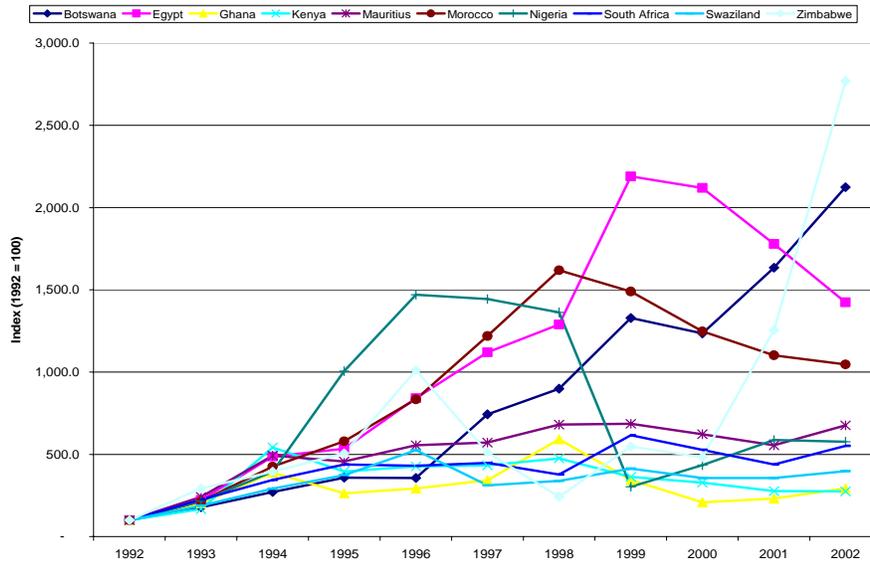


Figure 14
US dollar performance of African stock markets: annuity strategy



VI. CONCLUSION

This analysis has attempted to measure the performance of ten African stock markets during the 1993-2002 period, under lump-sum and annuity investment strategies. Table 4 shows a summary of the performance rankings under both strategies. Zimbabwe's stock market ranks first based on nominal and U.S. dollar returns. However, Botswana's stock market ranks first on the basis of real returns. Kenya's stock market consistently underperforms the other stock markets, regardless of measure or strategy.

As was shown by the analysis of the relative performance of Botswana's and Ghana's stock markets, the importance of the timing of inflows leads to significant differences in performance between the lump-sum and annuity strategies. Nevertheless, how much do the rankings differ under both strategies? This depends on performance metric in question. As table 5 shows, the correlation coefficient of the nominal performance rankings under both strategies is high, at 0.9636. With U.S. dollar and real returns, the correlation coefficient between the two strategies, though still high, falls to 0.9273 and 0.9152, respectively. The lowest correlation coefficient of 0.2485 is obtained between lump-sum nominal returns and annuity real returns. The correlation coefficients of the rankings are generally high when the two strategies are being compared, holding the metric constant. However, the correlation coefficients decline rapidly when nominal rankings are being compared to real or U.S. dollar rankings. Thus, the rankings are sensitive to the measure of returns—nominal, real, or U.S. dollar—being analyzed. However, they are not sufficiently sensitive to distinguish performance between the two investment strategies.

It is possible, though somewhat unlikely, that the performance rankings we found in this study are unique to the 1993-2002 period. Further research will involve extending the study to latter years and including the stock exchanges which did not have sufficient data for this study. In addition to returns, the relative risk and correlation of returns of the stock markets will have to be factored into an analysis with portfolio considerations. This will help to throw light on the appropriate relative weighting of investments in the stock markets for international investors. A test of the Fisher hypothesis in African stock markets is another potentially fruitful avenue of research.

Table 4
Summary of performance rankings

	<i>Lump-Sum Strategy</i>			<i>Annuity Strategy</i>		
	Nominal Returns	Real Returns	US Dollar Returns	Nominal Returns	Real Returns	US Dollar Returns
Botswana	4	1	2	2	1	2
Egypt	5	3	3	5	2	3
Ghana	2	8	7	3	8	9
Kenya	10	10	9	10	10	10
Mauritius	8	6	6	8	6	5
Morocco	7	4	4	7	3	4
Nigeria	3	7	5	4	9	6
South Africa	6	5	8	6	5	7
Swaziland	9	9	10	9	7	8
Zimbabwe	1	2	1	1	4	1

Table 5
Correlation of performance rankings

	Lump-Sum Nom. Ret.	Lump-Sum Real Ret.	Lump-Sum US\$ Ret.	Annuity Nom. Ret.	Annuity Real Ret.	Annuity US\$ Ret.
Lump-Sum Nom. Ret.	1.0000					
Lump-Sum Real Ret.	0.5152	1.0000				
Lump-Sum US\$ Ret.	0.6606	0.8909	1.0000			
Annuity Nom. Ret.	0.9636	0.6727	0.7576	1.0000		
Annuity Real Ret.	0.2485	0.9152	0.7091	0.4303	1.0000	
Annuity US\$ Ret.	0.4788	0.9394	0.9273	0.6121	0.8303	1.0000

ENDNOTES

1. Conceptually, this is equivalent to the beginning of 1993.
2. The standard deviation of annual nominal returns is 34% in Botswana versus 48% in Ghana between 1993 and 2003

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