Chapter 10; The theory and practice of investment strategy

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Introduction

In this chapter I reflect on the role of the economist/strategist in the business of managing wealth. It is a role I have played since my first involvement with the financial markets in the early nineteen-nineties.

I share the ideas about financial markets and their relationship to the economy that have informed my work as an investment strategist and economist in the financial markets. I say a little about my personal involvement in the financial markets.

I explain the importance of a well-considered investment strategy, for not only the wealth owner or their agents, the portfolio managers, but for the greater good.

These thoughts are followed by a case study of how I go about my work reading the financial markets that I hope will be of interest and helpful to those with a close interest in financial markets. The analysis offered is an example of pattern recognition that analysts and indeed all businesses rely upon to improve their predictions. This recognition has become so much easier over my years with the ready availability of low-cost computing power, most helpful software, and abundant data, easily downloaded. Exhausting the data, testing a theory, looking for evidence to support a theory, becomes a matter of minutes rather than the years it took when I first took an interest in financial markets. Theory and observation run together, observations lead to theory and theory is tested by observation. My attempts to understand and explain the links between the financial markets and the economy and the economy and financial markets remains a work in progress that I hope to continue for as long as it makes sense for me to do so and worthwhile for those who engage with me.

Some philosophy of saving and investing. The social role of the investment strategist

The essential task of the strategist in a wealth management business is to advise on how portfolios of assets and liabilities should be constructed. To offer advice on how the expected returns on the different assets available to an asset manager are best reconciled with the expected risks to those returns. It is a matter of how best to spend the risk budget, as my Investec colleague in London, John Haynes, would put it when our Global Investment Strategy Group met to review the world of investing, and determine and recommend the appetite for risk to the wider business in the construction of the portfolios our colleagues managed.

Neither the expected returns nor the possible risks to them can be known with certainty. Human nature, confirmed by many an observation, ensures that risk and return are negatively related, the more return expected from an asset, the greater the risk to the potential rewards. These risks however are imagined, they address an uncertain future.

Once the outcomes of any decision or plan of action are known, the race has been run and only the rewards or lack of them become relevant. How much risk was in fact taken to achieve the outcomes may become irrelevant to the winners or losers but is well worth knowing for future reference. The difference between good luck or good judgment is well worth recognising, but may not be obvious, especially to the lucky winners.

I have noticed that when the market has been well beaten and the winner is very well rewarded – as is the case with the highly successful entrepreneur – respect for the market system does not necessarily follow. They may not take the market and the competition as it seriously as they should, having so successfully beaten the competition. Convincing the self-made billionaire to respect the efficiency of the market process and how difficult it is, and should be, to overcome the competition, is not always easy to do.

The danger is that success in one venture does not follow to the next. A large element of what may well have been luck may not be repeated. Preserving wealth, deservedly or even luckily acquired, rather than putting it to further great risk, is the essential task of the wealth manager. This preservation of wealth is achieved through a well-judged allocation of capital among alternative employers of scarce capital. The opportunities this capital offers to business ventures of many kinds, is very valuable to society. It is much more valuable to society than if the wealth is frittered away.

Though as Adam Smith pointed out in his Wealth of Nations (1776) the ends of production are consumption. One might however add, better consumption later, than sooner, because the investments made possible by saving and not consuming, can earn good rates of return for the wealth owner, accompanied by the compounding growth in output and incomes of the wider community. If the process of saving and adding to the stock of productive capital continues consistently over many years on large scale, equivalent perhaps at an average rate of 20% of current GDP, it will be enough to transform the human condition by making work more productive and rewarding and less dangerous. Such has been the case for the developed world.

Past performance will not be ignored

Past performance, history that is, in the very broadest sense, may not be repeated, but it is the only reference point provided for any guidance offered by the strategist. Economic and financial history is the guide to the future and knowing that history and providing analysis of it is essential to the purpose of estimating prospective returns and for recognising the danger that they may not be realised. A deep knowledge of history and an ability to make good sense of it are essential to the purpose of the strategist.

Communicating this understanding to colleagues with well-argued and presented analysis is necessary to the purpose. The ability to understand ASAP what is going on in the economy, to quickly recognise the danger and opportunity in what inevitably are rapidly changing financial and economic conditions and to advise accordingly, with some conviction and logical consistency, drawing on the evidence of the past, will be highly valued by those are in the firing line - as they always are when managing wealth.

Risks are traded off for returns and how much risk should be assumed is a choice that wealth owners and their agents must exercise with deep care. The choices will depend on the circumstances of the wealth owner. How much they can afford to lose of their wealth following a particular risky strategy should be carefully considered and recognised. But safety comes at a cost in the form of lower returns. Deciding just how safe makes good sense is as much a choice as how much return to realistically expect.

The importance and value of a diversified portfolio

Diversifying a portfolio of assets and liabilities reduces the risks of unfavourable outcomes and improves the risk-return trade-offs. The opportunity well developed financial markets offer savers to diversify their portfolios, to separate the act of saving and investing, reduces risk and improves risk adjusted returns. This service is of great value to society. It encourages savings and capital formation that are essential if the incomes of the wider community are to improve over time.

It represents a form of specialisation of economic function, of the division of labour, indispensable for economic progress. Financial markets and financial institutions are intermediaries between those economic actors who save, from those who draw on those savings to invest in income generating assets. And are enabled to do so on a scale well beyond the scope of the non-specialised, individual saver-investor who had to perform both roles. The savings and real investment decisions have become more highly specialised, given the incentives to savers and investors that are provided by the institutions that make up the financial markets.

The financial markets through diversification and the pooling of risks can attract savings while offering lower expected returns to savers because the savings they attract are less vulnerable to unfavourable outcomes. They help reduce risk. And the benefits of lower costs of raising capital will be passed on to those wishing to raise capital, or to cash in on their successful enterprise, given essential competition on both sides of the saving – investing nexus, competition to attract savings and to allocate the savings well enough to make for a successful financial business. The spread between the cost of raising funds and the rewards for making the savings available is the potential profit margin for any financial intermediary and will be contested by competition both to attract funds and to allocate them effectively and profitably. In financial as in all markets it is competition that can be relied upon to convert self-interest into benefits for society at large.

A lower cost of capital, that is lower required returns for capital put at risk, encourages both saving and investing and hence the growth in incomes. Financial markets help improve the risk-

adjusted returns acceptable to savers and by so doing reduce the returns required to attract capital that will be applied to a specific purpose. Understanding the benefits of diversification and how they may be realised is very much part of the task facing the strategist. It is a worthy task. [1]

Notice the risk lovers.

Most but not all actions taken by investors are risk averse. Some participants in financial markets may be risk-loving, not risk averse. They may well have a bias – a long shot bias – that can also move markets. A bias that would allow risk lovers to accept less than the fair odds of success in exchange for a possible big win. Evidence from the outcomes of many thousands of horse races in the US indicated that the 100-1 outsider only wins every 150 times. The expected returns from backing the favourites was -5.5% while the expected returns from backing the long shots- when the odds are 100-1 is (-0.61%)

We discovered that the long shots in the share market, those that attract very high price multiples to earnings or book value, because of their promise of rapid future growth, on average provide lower returns than do the average of the stocks with low price to earnings multiples. The smaller chance of an exceptional return is their attraction. Average risk-adjusted returns are not the objective of the risk lover.

Chris Holdsworth wrote a profound report on the similarity of the risk loving behaviour of participants in betting on horse races and high flying- companies[2] It is the chances of a very large win that can explains why risk loving investors, that is to say gamblers, hope to beat the odds and accept less than "fair odds" for the opportunity to win big, that they occasionally succeed in doing. They may have a lot of fun in doing so, in finding a place well to the right of the mean in the distribution of returns.

Gambling is not just about the outcomes, about engaging in an activity that on average will provide negative returns that keep the gambling house in business. Gambling is also about the process, its entertainment value so to speak, that gamblers are willing to pay for. Few would gamble if it was just about the outcomes – that is accept certain negative returns on average over a lifetime of gambling which is the average experience. The life-changing chance of winning the lottery (even when the lottery pays out only half of what it takes in) is very low, but not impossible.

[1] I wrote first about the role of financial intermediation and intermediaries in 1972 at the request of the Standard Bank. It was referred to generations of my students and can I believe still can be a useful guide . *The South African Financial Structure, Supplement to the Standard Bank Review, September 1972 pp 23-31.*

[2] Chris Holdsworth, Long Shot Bias and the Equity Market, Investec Securities, Quantitative Analysis, Investec Securities, 18th April 2011.

This is an insight into the pleasures of risk taking that gained when recommending public policy for gambling in the new South Africa, shorn of its homelands where casinos were allowed and were a useful source of income for the local authorities. I participated in a consultancy in the late nineties, as a new dispensation for casinos in South Africa was being planned. Until 1994 the only casinos that operated were in the so-called homelands of South Africa. Our work was funded by Sun International that had dominated casino operations in the homelands and attempted to explain what a limited number of casinos in the urban areas might be worth to the licensees and why they should ideally be asked to bid competitively for the valuable license in cash and kind[3] Our advice was partly accepted and Sun International competed successful for exclusive rights to Casinos in some of the new provinces.

It should be recognised that starting a business is very much a gamble. On average, judged by past-performance, the start-up will provide poor returns for the owners capital, including any salaries sacrificed, when invested in such a highly concentrated way. Yet those who start a business, despite the low the odds of success, and succeed in beating the odds, add to the competition for the limited budgets of households and firms and are a vital stimulus to economic progress as innovators.

Holding undiversified, concentrated portfolios starting and running you own business, is a gamble that many fortunately think worth taking. Incidentally gambling in the financial markets is probably the cheapest way to gamble. It is almost a zero-sum game because the fees to participate are so low- given the intense competition for funds to manage - but the fees must be high enough to keep the market makers in business.

The importance of taking market behaviour very seriously. Activity maketh the market

The state of the market at any point in time reflects a temporary consensus about the prospects of an economy or the value of the companies that make up the economy. Such market signals should be well understood and respected. Knowing what the market is telling you and assuming is the starting point for any analysis that informs the decision taker. The judgments of the participants in the financial markets are made for their own income advancing reasons and must

[3] With Graham Barr we wrote what I think is a very elegant paper on gambling at casinos and how much people pay to spend time at the slot machines. We found that playing the low denomination machines gives you more playing time for any expected loss. Playing the low denomination machines is the cheaper option in the sense of what you lose per minute of time playing. Despite that at least in Las Vegas for which we could collect the data, the machines or games with higher minimum bets give the better odds. But the player is likely to exhaust any gambling budget more quickly- hence a more expensive option. South African Journal of Economics

be taken very seriously. Adopting a different view enough to buy or sell at market prices makes you a contrarian.

But only by disagreeing with the market consensus can any investor hope to add value – and be proven right or wrong - for daring to take what may be described as an active position. Only time can prove that the position was market beating or losing. That is better or worse than a passive, index tracking, position would have realised for the investor.

The research and insights that make it possible to take active issue with the market come with costs that must be recovered in fees earned, some of which the passive index tracking investor can avoid. Hence the active investor must justify the fees charged their clients with better risk-adjusted returns or by providing a better service to the client. Including an asset allocation service tailored to the circumstances of the client that will evolve over time. Asset allocation, the right mix of assets, the right mix of economies, as well as of companies and securities to invest in to diversify risks, which cannot all be found in any one index, cannot be a passive exercise. It takes judgment that is demanding and time consuming that has to be rewarded, if the service is to be provided.

There is a related issue. It takes activity to establish a resilient market in any asset. A market in which assets can be liquidated by an individual seller or acquired by an individual buyer, without much affecting the price of the asset. The reasons for the sale or purchase may have little to do with the state of the market. Circumstances may simply have changed for the wealth owner or the issuer of a security to justify the disposal or acquisition. It will not be undertaken because the market is regarded as over or undervalued at the time.

Investment decisions based on finding the right time to buy or sell, of the kind the active traders may attempt, add the necessary depth to the market in an asset, make buyers or sellers price takers rather than price makers. Just how much activity is necessary to this purpose and how much flows of funds into passive management influence the direction of the market remains an open issue. What is clear is that the passive investor, the benchmark tracker, is free riding on the market making activities of the active investor or trader. There cannot be well considered, information driven valuations of assets without well informed active investors and traders. Not every investor can be a follower. Some must lead for others to want to follow.

Making sense of the financial markets – a career in itself

As a strategist with a focus on the workings of the whole economy and its financial markets I would apply and communicate my understanding of what was going on in the economy. I would try and make as much good sense of current market developments as I could. I would look especially for market aberrations, temporary relationships that did not necessarily make sense and could be expected to revert to the regular.

The predictions about government and central bank reactions to the observed events were an important part of the service. This was a particularly important role to have to play in extreme

circumstances – during a financial crisis – when uncertainties were most pronounced. A knowledge of the past, of history, would provide a perspective on how governments could and would react to the dangers of financial implosion. The Global Financial Crisis of 2008-09 provided one such opportunity to be relatively calm in a storm that you had reason to believe would pass-with help from central banks.

I would write many a report and give many more presentations to audiences, small and sometimes large when clients were invited to attend. Knowing as well as one could know what was going on in the world of economies and their financial markets and sharing that knowledge was the primary task. Drawing the implications for the future followed with as much conviction as could be justified. The requirement to being logically consistent in your assumptions and conclusions is an important test of any analysis. Of your own and of the market commentary of others about which you would be called upon for an opinion.

Being right for the right reasons was the holy grail. Luck can play a large role in the outcomes not only for investors, but also for those who advise them. Understanding why your reasoning may have failed, for bad luck, or worse, because of poor analysis becomes part of the learning experience. Having survived tough times in the financial world is something of a recommendation. Humility about the ability to beat the market consistently is indispensable.

The relationship between risk and return

It is very clear that all the different national financial markets are closely linked by flows of capital-of accumulated savings – that originate widely in many different economies and flow freely across the exchanges in the search for improved returns. It is the flows of global capital that leads financial market developments everywhere, when and where they are open to business. The South African markets opened to large flows of capital in both directions only after 1995 as was discussed in Chapter 2.

Those who allocate funds across frontiers and to different asset classes will tend to share a global view on risk taking or will have to respond to the changing appetites for taking on risk or attempts to avoid or rather mitigate risk. There are safer and more risky assets that respond differently when risk appetite is stronger or weaker. They may be described as safe havens or high beta plays or something in-between. The values of the safe-haven assets are more predictable, less likely to lose value, or may even gain value, when risks become elevated. The high beta plays gain more and lose more as risk appetite waxes and wanes.

South African securities are a high beta emerging market play. The rand and the JSE tend to move more than proportionately in response to emerging market trends. And emerging markets are high beta plays on the global economy and changes in global risk appetite. We observe and explain these relationships in depth in our case study.

Risks can be measured accurately. They are revealed by the well-developed markets that supply insurance against risk at a charge. These insurance premiums are reflected in the cost of an option to buy or sell an asset or an Index of them in the future at an agreed value. The higher the perceived risks, the higher the cost of insuring against a loss or gain in the future value of a security.

The risk to any asset holder is simply the risk that the price of the asset they hold may rise or fall from its current level. The chances of a rise or fall from the current market determined price, assuming a well-developed market in them, with many buyers and sellers, is about the same 50% on any one day or part of any day. Market prices in well-developed markets will follow a random walk, rising and falling in an irregular sequence essentially unpredictable sequence. However, in riskier times the daily or hourly moves in both directions, up and down, become significantly wider, while the average move over any period will still stay close to zero.

When the sense of the future becomes less certain, the standard deviation of daily moves about the average of zero widens, and the cost of insuring against such changes in market prices inevitably increases.

I have long thought that the distinction between risk and uncertainty that originated with one of the original Chicago economists, Frank Knight, [4]is a helpful one. Risks are insurable, because they are based on many observable historic events, for example on incidents of fire, theft, road accidents, debt default or death. This knowledge allows for well-established probabilities to be assigned to a prospective event, and so for the pooling of risk. Supplying insurance is another activity that benefits from diversification. Insuring one car or house is much more risky than insuring thousands of them in a variety of locations.

Uncertainty applies to imaginable events that no insurer will cover. For example, the risk to the profits of a business that may fail cannot be insured. The success or failure of any established business is too uncertain to be covered by insurance. There is too small a sample of similar ventures to provide any strong sense of how the outcomes might materialise, how the insured

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4 **Frank Hyneman Knight** (November 7, 1885 – April 15, 1972) was an American economist who spent most of his career at the University of Chicago, where he became one of the founders of the Chicago School. Nobel laureates Milton Friedman, George Stigler and James M. Buchanan were all students of Knight at Chicago. Ronald Coase said that Knight, without teaching him, was a major influence on his thinking.[1] F.A. Hayek considered Knight to be one of the major figures in preserving and promoting classical liberal thought in the twentieth century.[2] Paul Samuelson named Knight (along with Harry Gunnison Brown, Allyn Abbott Young, Henry Ludwell Moore, Wesley Clair Mitchell, Jacob Viner, and Henry Schultz) as one of the several "American saints in economics" born after 1860.[3]

losses of some will be offset by the better fortune of others all willing to pay an insurance premium and leave enough over for the underwriter. The risks that the value of the home will be undermined by taxes or the failure of the local authority to deliver essential services to the home is another uncertainty to be borne by the owner. The risk that the house will be destroyed by war or occupied by an invader, foreign or local, is another essentially uninsurable possibility.

Measuring the risks to investors in financial securities

These observations on risk can be reinforced with the aid of a few charts that describe the behaviour of the most important of all the global equity indexes, the S&P 500 Index of the 500 largest companies listed on the New York exchanges. The index is weighted by the market value of the different companies. The direction taken by the S&P 500 will have an influence on all equity valuations everywhere. Understanding the forces driving the S&P equity benchmark are very helpful, indeed indispensable, in interpreting share price moves more widely.

A full model of these forces that move the S&P 500 Index is presented and estimated in our case study. Risk is one of those forces identified. Changes in global risk tolerance, of risk surprises or shocks, are risks investors have to accept and hopefully can anticipate and adjust to such prospects in the offers they make for assets, or insure against. Investors will have an opinion about the direction of risk tolerance.

Risks, as measured, may be thought to revert to some long-term average. Whether they will do so in the future and how soon they will revert, will be matters of judgment to be exercised by investors. The rewards for forecasting risks accurately would be immense, but it will always be a risky business to attempt to do- that is to self-insure and let the market take its course. Which is what most investors do when they invest for the long term. They will be rewarded with higher returns for accepting the risk that come with time- again if past performance in the many cases of economic progress sustained over time- is to be drawn upon. That is absent war or revolution that can expropriate wealth without compensation or destroy it.

Not all investors have this luxury of taking the long view, of being able to bear risk and accordingly sacrifice returns to avoid risk. Extra returns are the expected reward for time in the market that demands a higher degree of risk tolerance.

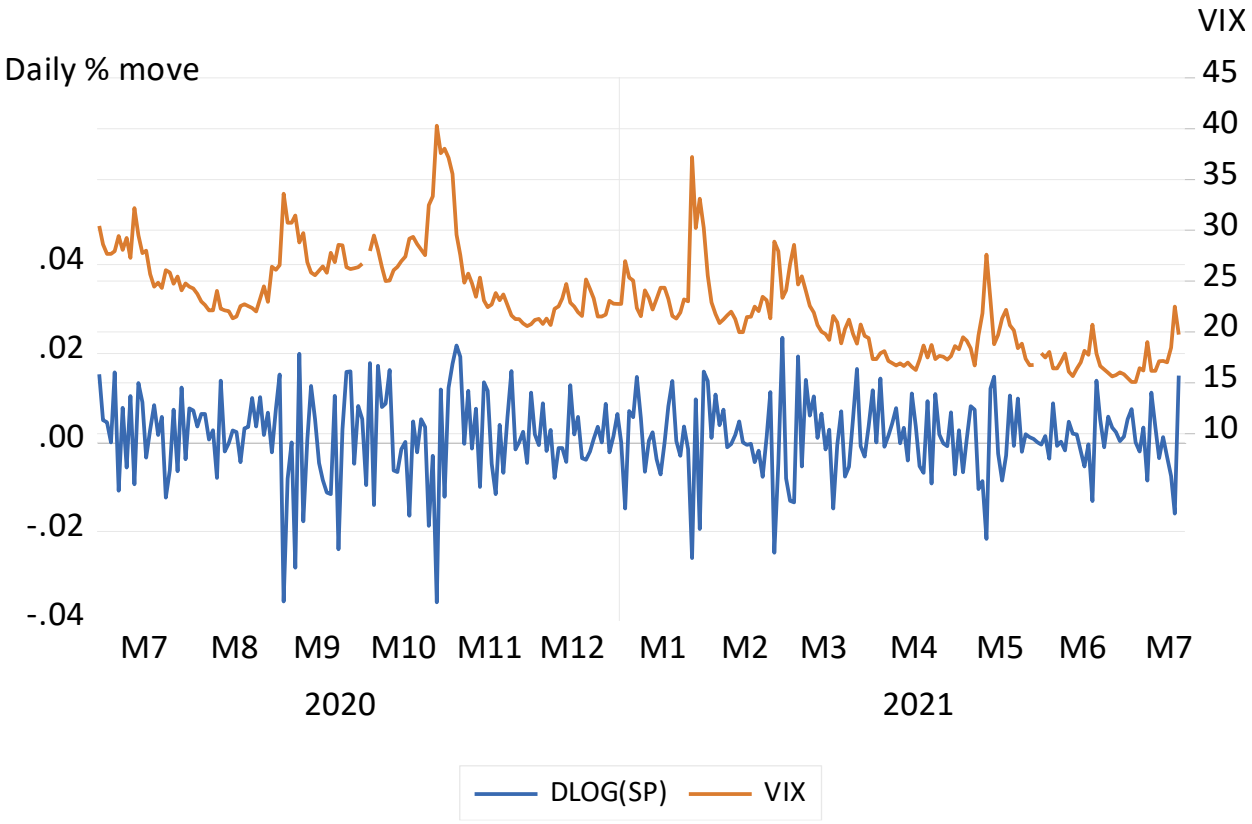
Demonstrating and measuring equity market risks

Risks to the S&P 500 are measurable and can be insured taking options on the market. The cost of insurance, of such options to trade in the future at price agreed to today, rises and falls with these risks. In figure one we show the daily percentage moves in the Index over the past 12 months and compare them to the volatility index on the S&P, the VIX, that represents the cost of an option on the future level of the S&P Index. The VIX is itself actively traded.

As may be seen in the figure below the daily moves in the S&P Index are random, though their amplitude varies. Such randomness is also true of hourly movements in the Index. As may be seen the daily percentage changes in the S&P were well above average between October and December 2020 and that the VIX is highly elevated over these months. The daily average percentage move in the S&P over the period June 2020- July 2021, was (0.0012) - close to zero – though positive - indicating an upward drift as the market strengthened over the period. The average standard deviation (SD) about this average over the period was about eight times higher or (0.010) The daily percentage move in the VIX was also close to zero with a SD of (0.78)

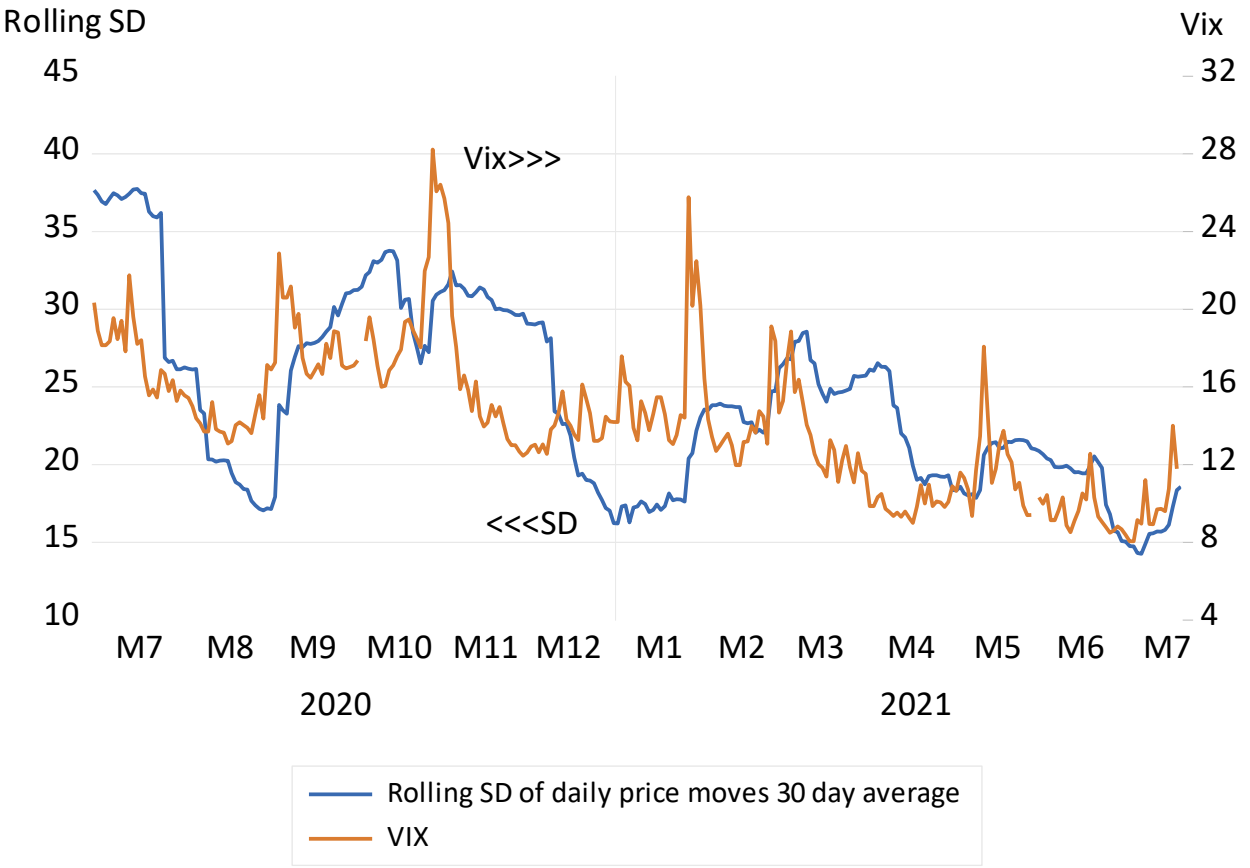
Volatility is understood as the standard deviation about an average price. The more volatility expected the greater the risk in holding the asset and the more expensive it becomes to insure the asset against a price increase or price decline. Expected volatility and the cost of insuring against volatility is closely linked to the amplitude of recent price moves, as will be demonstrated in figure 2.

Fig. 1; Daily percentage move in the S&P 500 and the Volatility Index (VIX) June 2020- July 2021



The VIX as may be seen closely accompanied the daily moves in the S&P 500 Index. A rolling 30-day average SD of these daily fluctuations in the index moves closely in line with the Vix as is shown below. The Vix leads and the average SD follows consistently.

Fig.2; The volatility index and the thirty-day moving average of the Standard Deviation (SD) of daily price moves.



The average value for the VIX over these 274 days of trading illustrated above was (22.8) and the average 30-day standard deviation (SD) of daily price movements about the average, similarly annualised was a lower (15.3) This is a consistent pattern that can be observed over long periods of time, that implied volatility is more variable than realised volatility – defined as a rolling moving average over 30 days - that by definition -takes time to unfold. The daily correlation of the two measures of volatility is very high (R=0.89)

Risk and returns are negatively correlated and significantly so

Another regularity to be observed is the generally negative relationship between the VIX and the S&P and between changes in the VIX and the S&P 500 index. The explanation of the negative correlation is that the prices of what has become a riskier asset must fall to improve prospective returns. The correlation between 2005 and 2021 of daily percentage changes in the VIX and daily percentage changes in the S&P 500 is (R=-0.72). These daily moves in the VIX were also a random walk with significantly larger amplitude. Risk itself is very risky.

Fig.3; Daily moves in the S&P and the Vix. A scatter plot with a regression fit

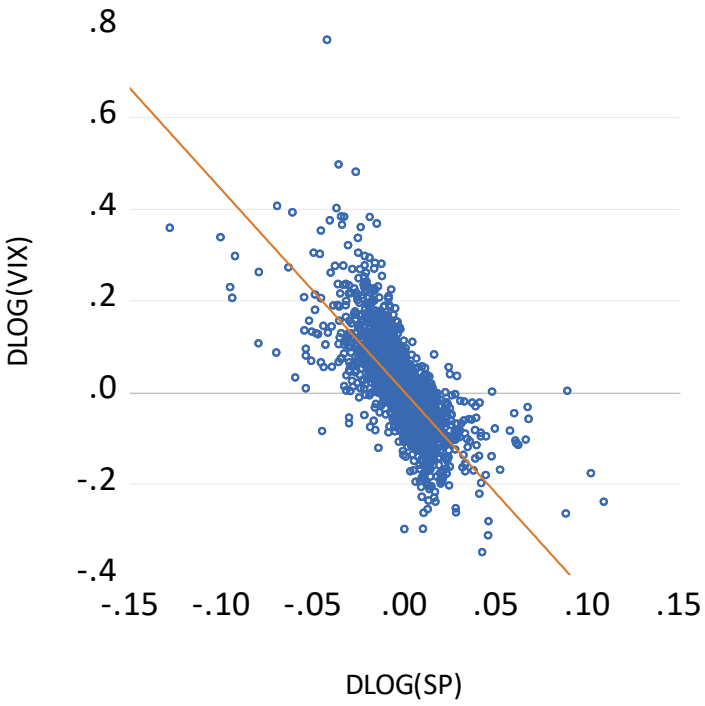
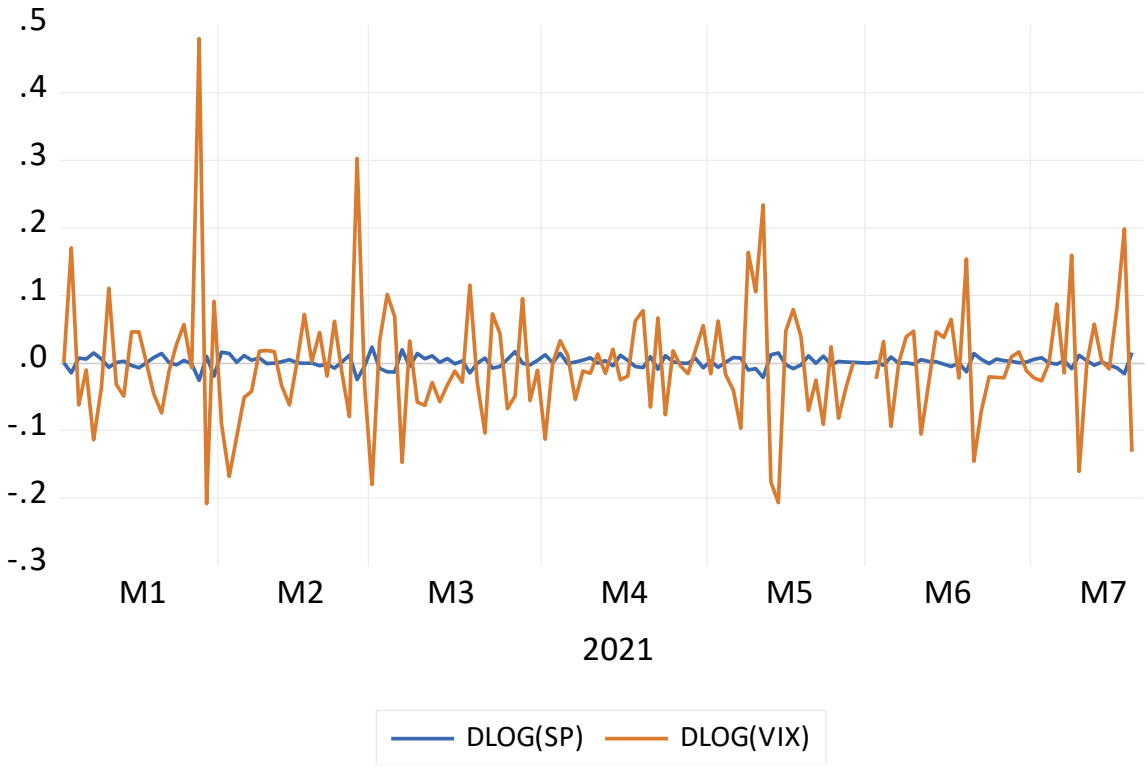


Fig.4; Daily moves in the S&P 500 and the VIX



Clearly it would be very valuable to be able to predict volatility or changes in the volatility of price movements that have such highly predictable effects on asset prices. But predicting a surprise or shock, of what constitutes a surprise or shock, is logically inconsistent. There is no theory with which to predict the timing of the random shocks that move markets.

Coming to terms with a shock that moves markets

The VIX has a mean reverting character as can be demonstrated with statistics. If the VIX goes higher it can be expected to recede to some longer-term average based on past performance. Presumably because it turns out that the end of the world as known, was not as nigh as it appeared to be earlier - of which there was demonstrably not great confidence -given the extreme levels of risk that are priced into the markets in times of crisis. It takes confidence that all will return to something like normal to sell volatility when it has reached extreme levels- or to buy volatility when it becomes very cheap to do so. Confidence that this time will not be that different, which is the consensus view, reflected by the risk measure and the cost of insurance. Taking a position on volatility is a contrarian judgment.

The daily moves in the S&P index have returned to something like normal, in time, post the recent crises of 2009 and 2020 as shown above when the VIX went to extreme levels. Below we identify some of the regularities of the post-crisis adjustments made in recovery from the Global Financial Crisis of 2009 and the financial crisis that accompanied the lockdowns of 2021. We show that the markets have adjusted fully and similarly to the surprises that initially made the equity market

and other financial markets much more volatile. This is presumably because in time more will come to be known about the nature of any shock and how it will influence all the other economic forces that determine the value of a company or index of them or a bond or currency. Investors will in time get to know more and build more confidence in their estimates of the future value of an asset or collection of them. With better understanding of the economic and financial forces at work, including the importance of the response of governments and central banks to the crisis, daily price movements will have less reason to change dramatically from day to day. The always temporary market consensus about the value of an asset would have better reason to hold, as investors become better informed post any shock, or simply believe themselves better informed. The shock therefore will have worked itself through, proving this time was not in fact very different after all, that past performance can again help guide forward looking actions.

The market may settle at a higher or lower level as the consensus on the future becomes a stronger one as more is revealed about the post-shock economy. But wherever the market drifts higher or lower trends, up or down, day to day volatility is likely to decline as there is less reason for any investor to challenge the consensus, bidding the prices of securities higher or lower on any one day. But all else that influences the value of a share or bond or currency remaining the same, less risk means higher prices and vice-versa.

Volatility may be good for some

Not all the participants in a market are fearful of volatility because they are not all risk averse. The successful trader, perhaps a hedge fund, with a very short time horizon to put capital at risk, will welcome the opportunities volatility provides. The upsides and downsides of market price movements are wider, of which they hope to take advantage getting the timing right. They will also welcome the increased volume of trading that will accompany more volatile markets.

The recognisable patterns of behaviour of different assets after a shock.

This post lockdown article was written with my case study on the behaviour of the markets very much in mind. The models did not work as well when they included the impact of the lockdowns which led to the thought that crises are different, and the crisis regularities were identified, as were explained in the article.

The anatomy of economic crises and recoveries from them[5]

[5] Written on July 21st 2021. Published by Investec and Business day

Life has returned to normal in the US and UK –judged by the crowds attending Wimbledon, Wembley and Whistling Straights. With only the occasional offending mask to remind us of a crisis passed. The normal is again guiding our expectations and economic actions and is determining the value of the assets we own.

That is normal for now and until the next expected or actual crisis again moves the markets. It's timing, causes and consequences will remain one of the great known-unknowns, perhaps it will even be an unknown- unknown. [6] But if not without precedence, the successes of recent crisis management may help put us in a better position to cope. Such a belief would be immediately wealth-enhancing. Less perceived risk always enhances the values of income producing assets.

An economic crisis may be defined as a serious disruption of economic activity and the severe loss of incomes and benefits gained producing goods and services and consuming them. A crisis is therefore destructive of the value of the assets we own that depend on such incomes so threatened.

A crisis is much worse than your average recession when GDP declines by a mere per-cent or two below trend for a year or so. The failures of the banks and insurance companies in 2008 -2009, the Global Financial Crisis (GFC) threatened to implode the real economy with them. In 2020 economies were shut down summarily to escape the pandemic with the loss of as much as a quarter of potential GDP, a very large sacrifice of potential incomes and output.

Overcoming these two crises relied essentially on governments and their central banks. In the case of the GFC it required central banks to shore up the global financial system buying assets from banks and financial institutions on a vast scale in exchange for central bank money. Creating money when only extra money can keep financial institutions afloat. The responses to the crisis of 2020, at least in the developed world, were more immediate and less equivocal and on a larger scale than after 2008. They added much direct income relief to the monetary injections. They have surely succeeded not only in reducing the pain of lockdowns but in ensuring that demand for goods and services would recover with the supply of goods, that a return normality makes possible.

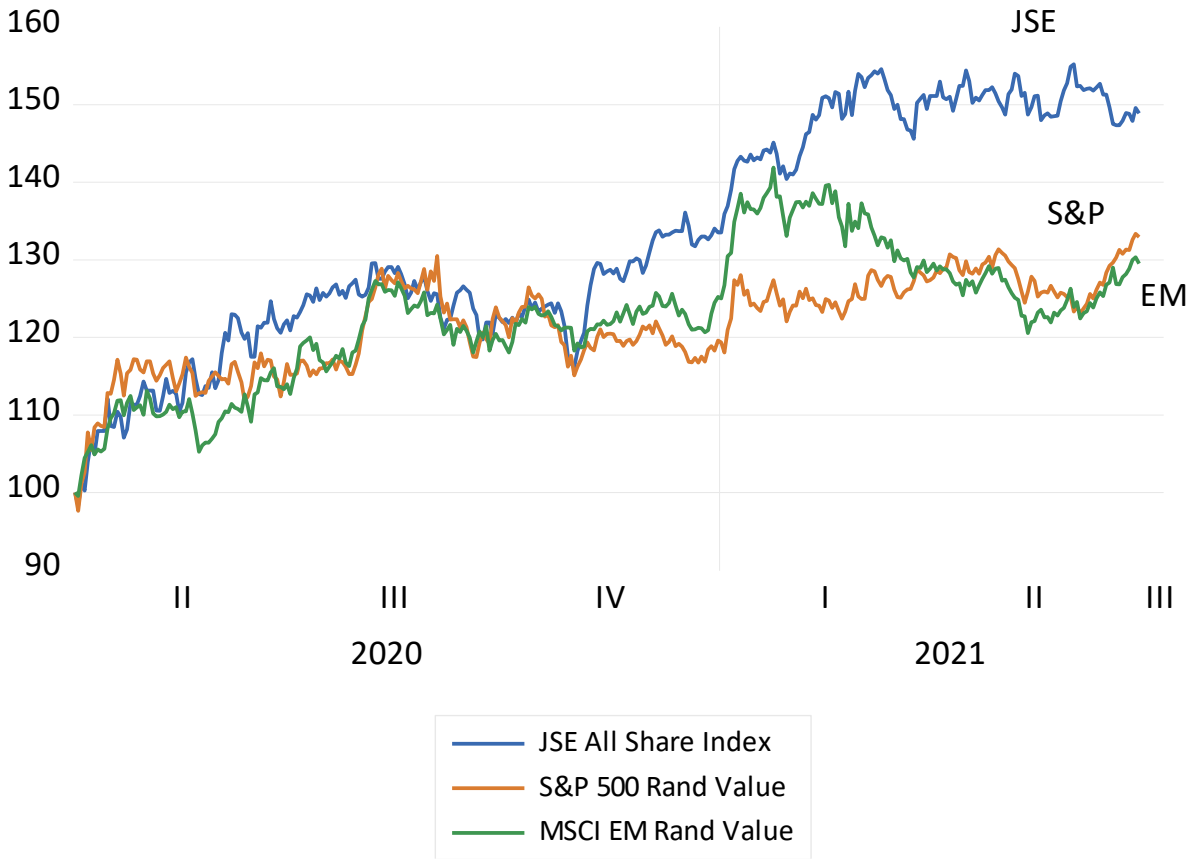
[6] In the words of Donal Rumsfeld who passed away recently at age 88 to much acclaim form conservative circles in the US as a man who served his country with honour and devotion.

Judged by the signals provided by the markets in shares, bonds commodities the economic crisis is well behind the developed world. US, Emerging market (EM) and therefore South African companies are now worth significantly more than they were when the lockdowns became a reality in March 2020, when the US Index lost 13%, the EM Index 17% and the JSE in USD gave up 27% of its USD value in March 2020. The JSE had lost 14% of its value the month before.

The JSE from these lows of March 2020 is a distinct outperformer, in dollars and in rands. The JSE has gained 50% compared to a 30% gain for the S&P and EM Indexes when converted to rands. In the much weaker USD/ZAR the gains since the trough are even more impressive. The JSE is up 86% compared to the 66 and 61 per cent gain for the S&P and EM since the crisis lows.

This indicates one of the crisis regularities. South African assets and incomes are highly exposed to changes in global risk, losing more during a crisis and then gaining more than the average EM equity or bond when the crisis is over. It is also worth noting that the JSE has not moved much since March 2021- another sign of normality. If only we had the gumption not to waste a good crisis.

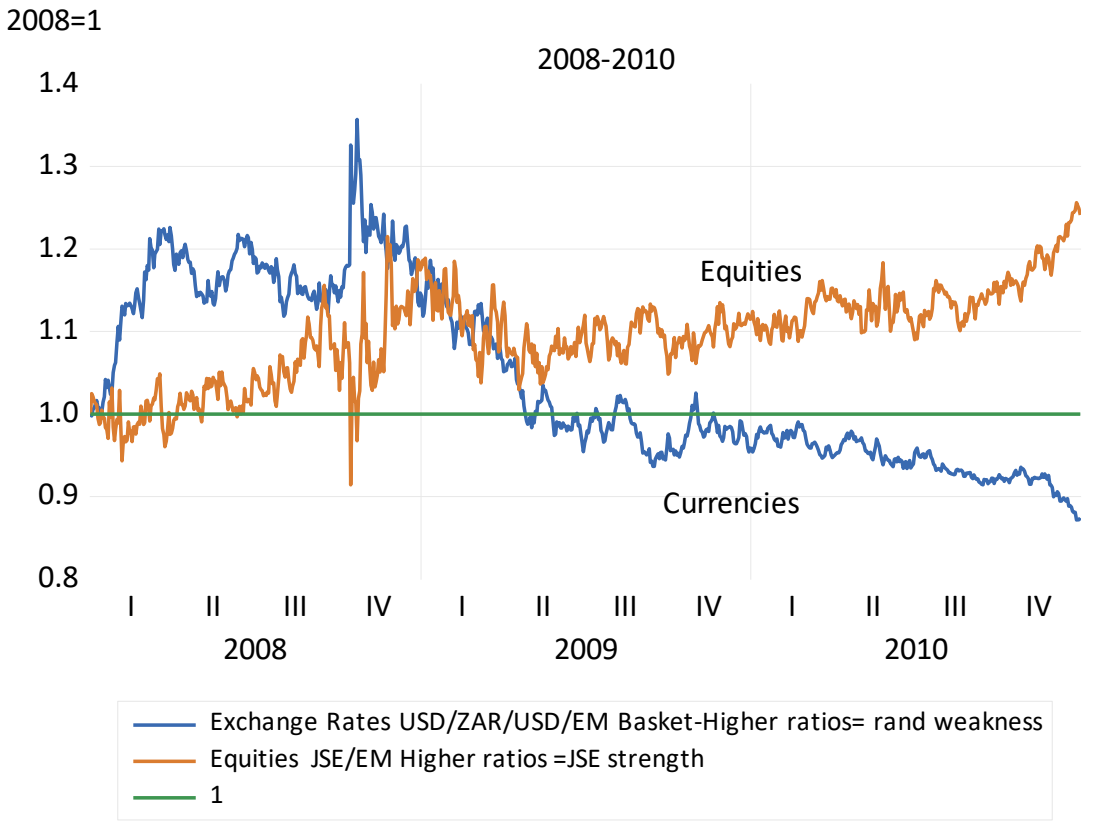
The JSE compared to the S&P 500 and the MSCI EM Rand Value. Daily Data. (January 2020=100)

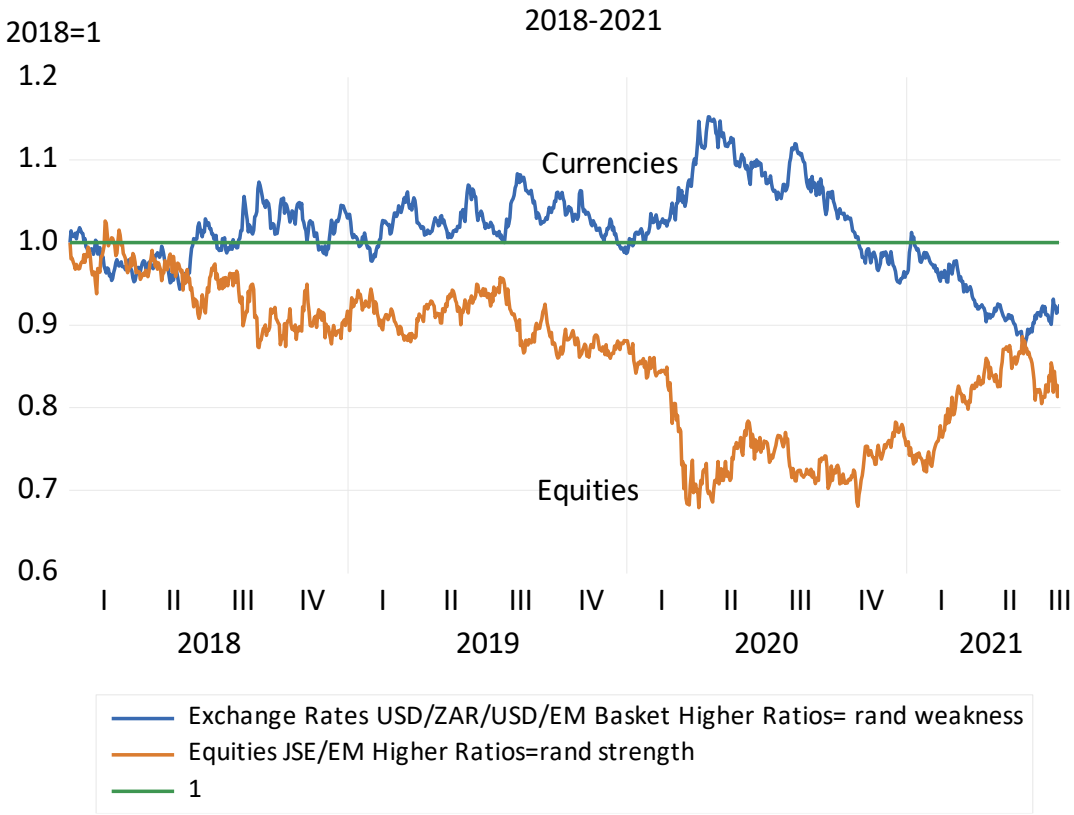


Source; Bloomberg and Investec Wealth and Investment

Which illustrates another regularity when an economic crisis is not of South African making. The ZAR is a high beta EM currency – doing worse when risks are elevated - and better than the EM peers when global risks decline- as is the case with the JSE. During the height of the present crisis the USD/ZAR exchange rate and the JSE were 30% weaker Vs the EM peers. They are now back to the normal long-term relationship of an average of one to one.

South African USD/ZAR and the JSE – Ratios to EM currencies and Equity Indexes (JSE/EM) Daily Data 2008-2010 and 2018-July 2021.

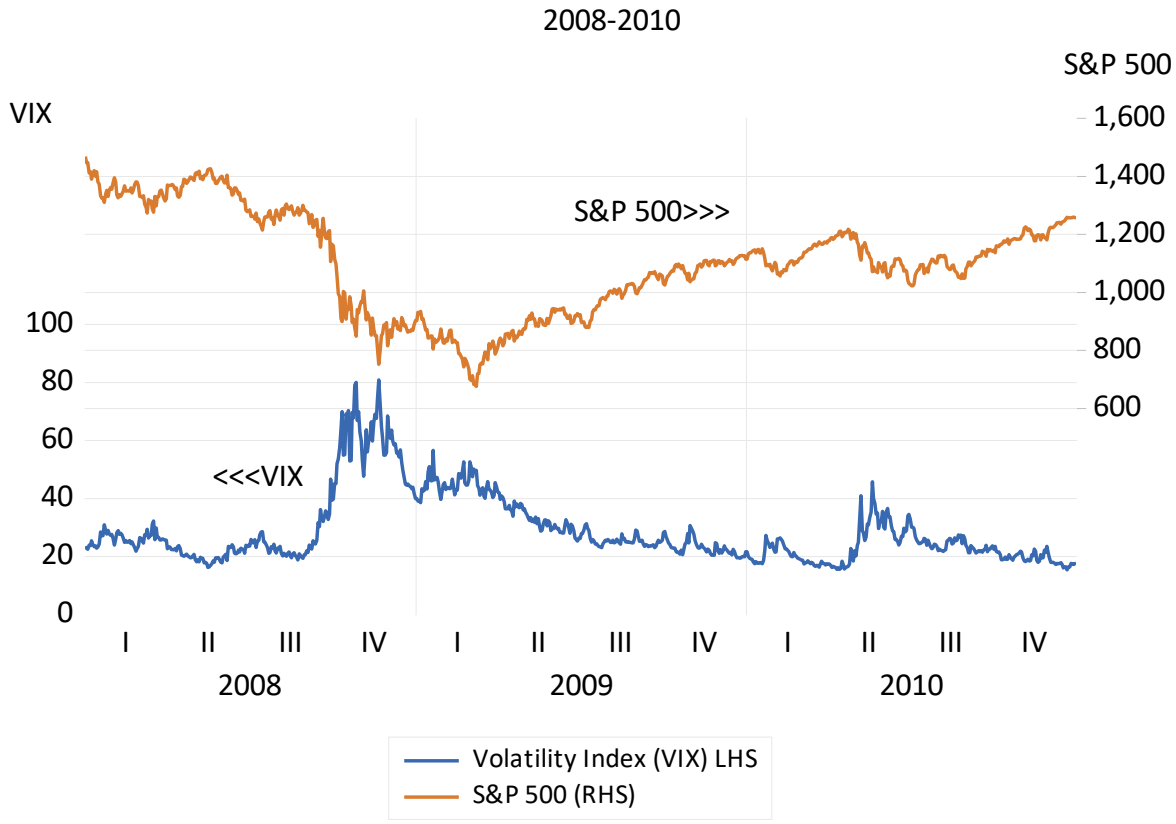

2008=1
2008-2010
1.4
1.3
1.2
1.1
1.0
0.9
0.8
Equities
Currencies
I II III IV I II III IV I II III IV
2008
2009
2010
Exchange Rates USD/ZAR/USD/EM Basket-Higher ratios= rand weakness
Equities JSE/EM Higher ratios =JSE strength
1

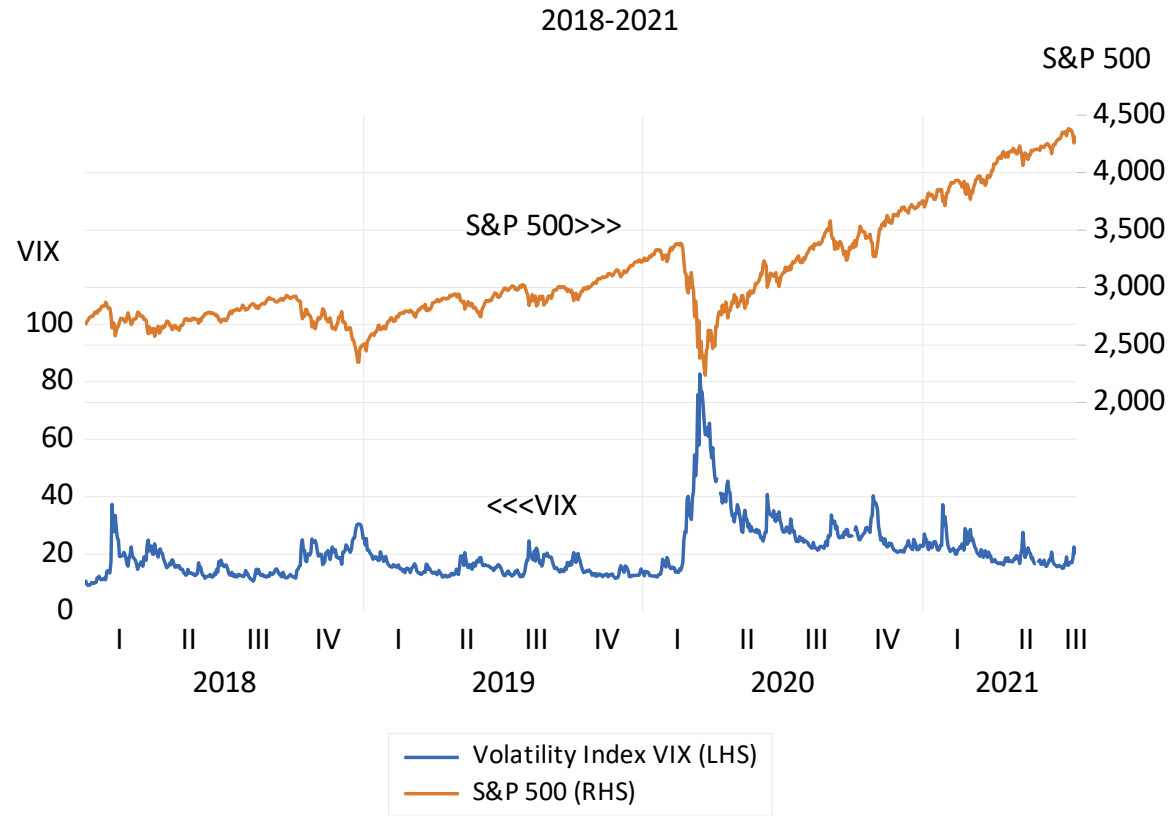

2018=1
2018-2021
1.2
1.1
1.0
0.9
0.8
0.7
0.6
Currencies
Equities
I II III IV I II III IV I II III IV I II III
2018
2019
2020
2021
Exchange Rates USD/ZAR/USD/EM Basket Higher Ratios= rand weakness
Equities JSE/EM Higher Ratios=rand strength
1

Source; Bloomberg and Investec Wealth and Investment

Global market risks are easily identified by the volatility of the S&P 500 index, as represented by the volatility index, the VIX. When these daily moves become more pronounced and share prices bounce around abnormally, the cost of insuring against market moves becomes ever more elevated –Shares lose value when the future appears much less certain. Higher expected returns, hence lower share prices, compensate for increased risks. The Vix goes up and share prices go down in a crisis. (see below)

Volatility and the S&P 500 Index. Daily Data 2007-2010 and 2018-2021 July.


2008-2010
S&P 500
VIX
1,600
1,400
1,200
1,000
800
600
S&P 500>>>
100
80
60
40
20
0
<<<VIX
I II III IV I II III IV I II III IV
2008
2009
2010
Volatility Index (VIX) LHS
S&P 500 (RHS)


2018-2021
S&P 500
4,500
4,000
3,500
3,000
2,500
2,000
S&P 500>>>
VIX
100
80
60
40
20
0
<<<VIX
I II III IV I II III IV I II III IV I II III
2018
2019
2020
2021
Volatility Index VIX (LHS)
S&P 500 (RHS)

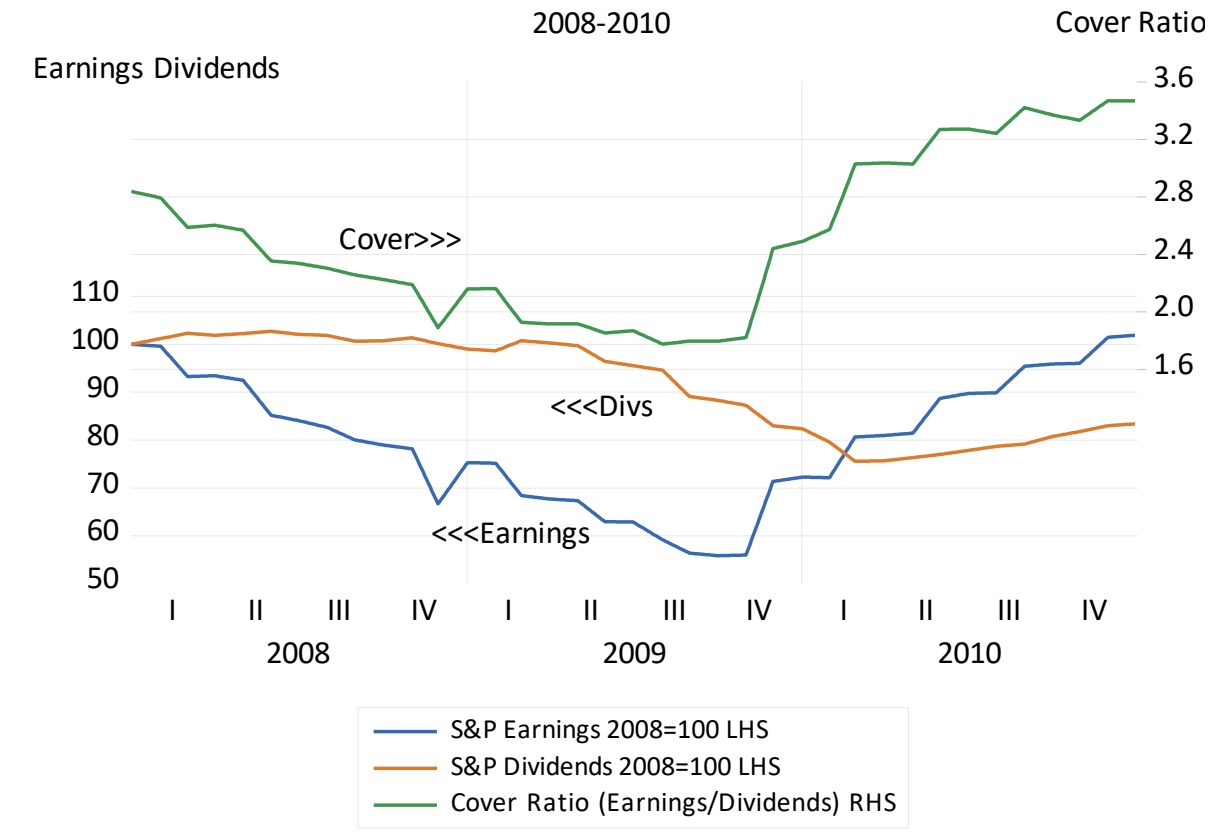
Source; Bloomberg and Investec Wealth and Investment

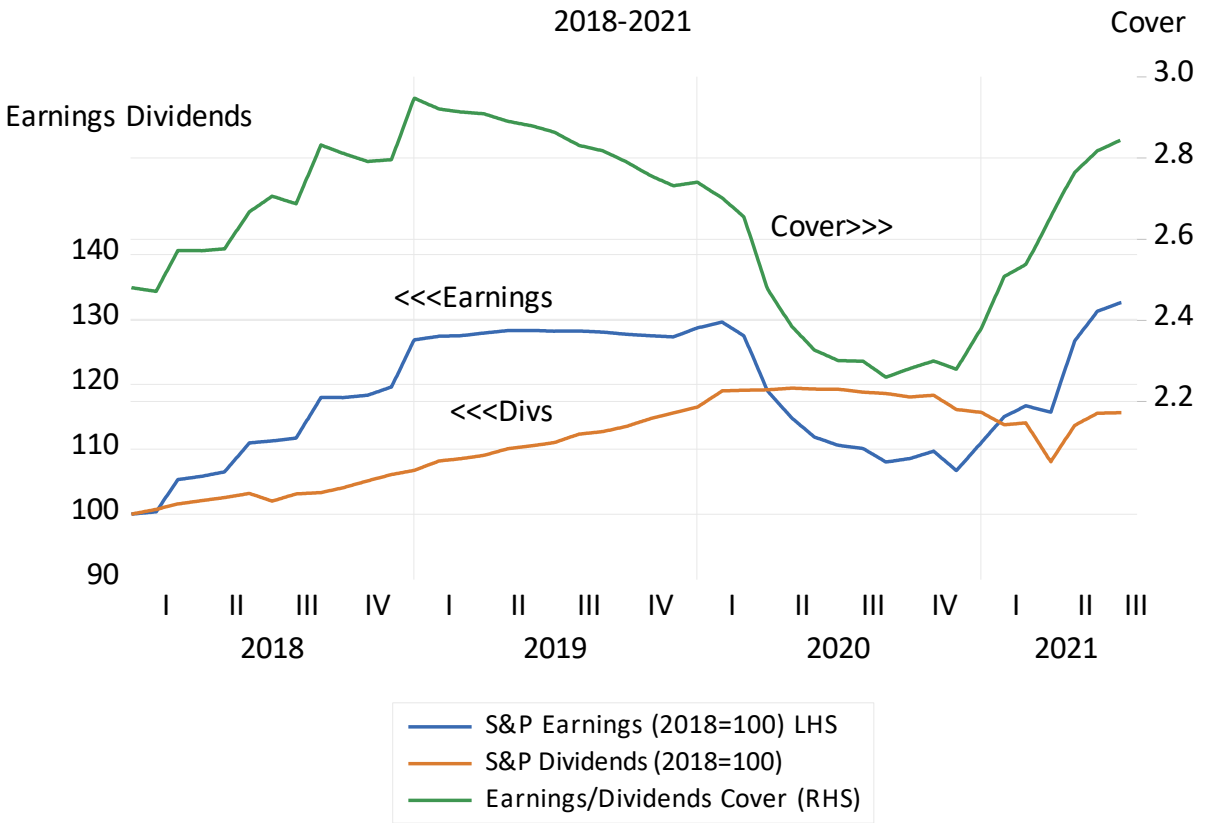
The daily average for the Vix since 2000 is 19 – it was over 80 at the height of the crises. It is back to 19.

The S&P 500 index is now in record territory in nominal and real terms. In inflation adjusted terms the S&P 500 is up about 4.6 times or by an average 7.4% a year since the low point of the financial crisis. Real earnings over the same period have grown at an annual average rate of 5.9% p.a. since 2009. A truly well above average performance.

Another crisis regularity is the behaviour of the cover ratio – that is the relationship between earnings and dividends that is normally very close. The more cash retained (the less paid out) the more value added for shareholders. (See figure below)

The S&P 500 Index and the Cover Ratio (Earnings/Dividends) Daily Data 2008-2010 2018-2021 July


2008-2010
Cover Ratio
Earnings Dividends
3.6
3.2
2.8
2.4
2.0
1.6
Cover>>>
110
100
90
80
70
60
50
<<<Divs
<<<Earnings
I II III IV I II III IV I II III IV
2008
2009
2010
S&P Earnings 2008=100 LHS
S&P Dividends 2008=100 LHS
Cover Ratio (Earnings/Dividends) RHS


2018-2021
Cover
Earnings Dividends
3.0
2.8
2.6
2.4
2.2
Cover>>>
140
130
120
110
100
90
<<<Earnings
<<<Divs
I II III IV I II III IV I II III IV I II III
2018
2019
2020
2021
S&P Earnings (2018=100) LHS
S&P Dividends (2018=100)
Earnings/Dividends Cover (RHS)

Source; Bloomberg and Investec Wealth and Investment

The implication is that the extra cash retained will be well invested and earn above its opportunity cost. S&P Earnings are again rising much more rapidly than dividends – that held up better during the crises. Indeed, analysts, absent the usual guidance from the managers of the companies they report on, are still struggling to catch up with the buoyant earnings recovery now under way. Earnings surprises are very much the abnormal order of the day.

The cover ratio for the JSE follows a similar pattern in times of crisis and has a similarly negative impact on share valuations. The more dividends paid out relative to earnings – the less cash reinvested in the average JSE listed company - the less these companies are generally worth. The recovery in the cover ratio to something like their longer- term averages is another sign of normality- as well as providing support for share prices. Ideally the JSE cover ratio would decline with the opportunities to invest more in ways that would add value for shareholders on the JSE.

A further regular feature of the economic crises of recent times and the recovery from them has been the behaviour of commodity and metal prices that make up the bulk of SA's exports that play such a large role in the economy. They fall during the crisis and they recover strongly as the crisis passes by, as they are doing now. Metal and mineral prices lead the South African business cycle in a very regular way. Commodity prices lead, the rand follows, inflation is then contained and interest rates, at worst, do not rise. And the money and credit cycles accommodate the rising incomes that emanate initially from the mining sector.

We are far from the super cycle we benefitted from in the lead up to the Global Financial Crisis of 2008. But here's hoping above normal demands for metals will

continue to impress themselves on below normal supply responses in the form of higher prices.

Industrial Commodity Prices Daily Data 2008-2010 and 2018-2021 July 9th (January 2008=100)

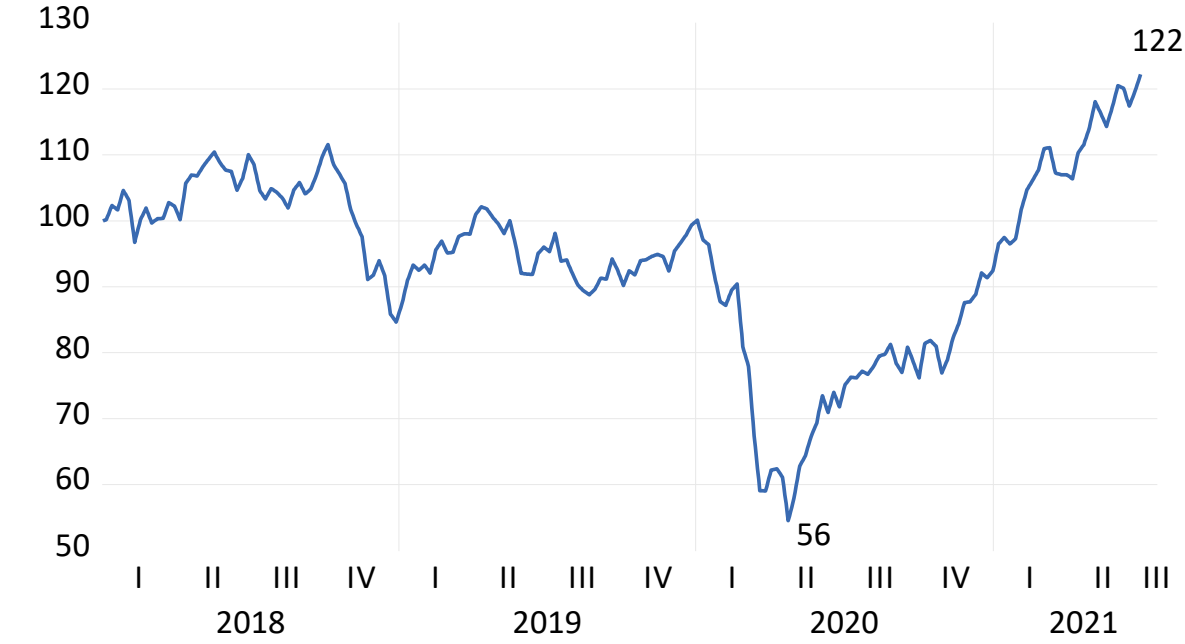
2008-2010

Commodity Prices

2008=100

Commodity Prices

2018=100



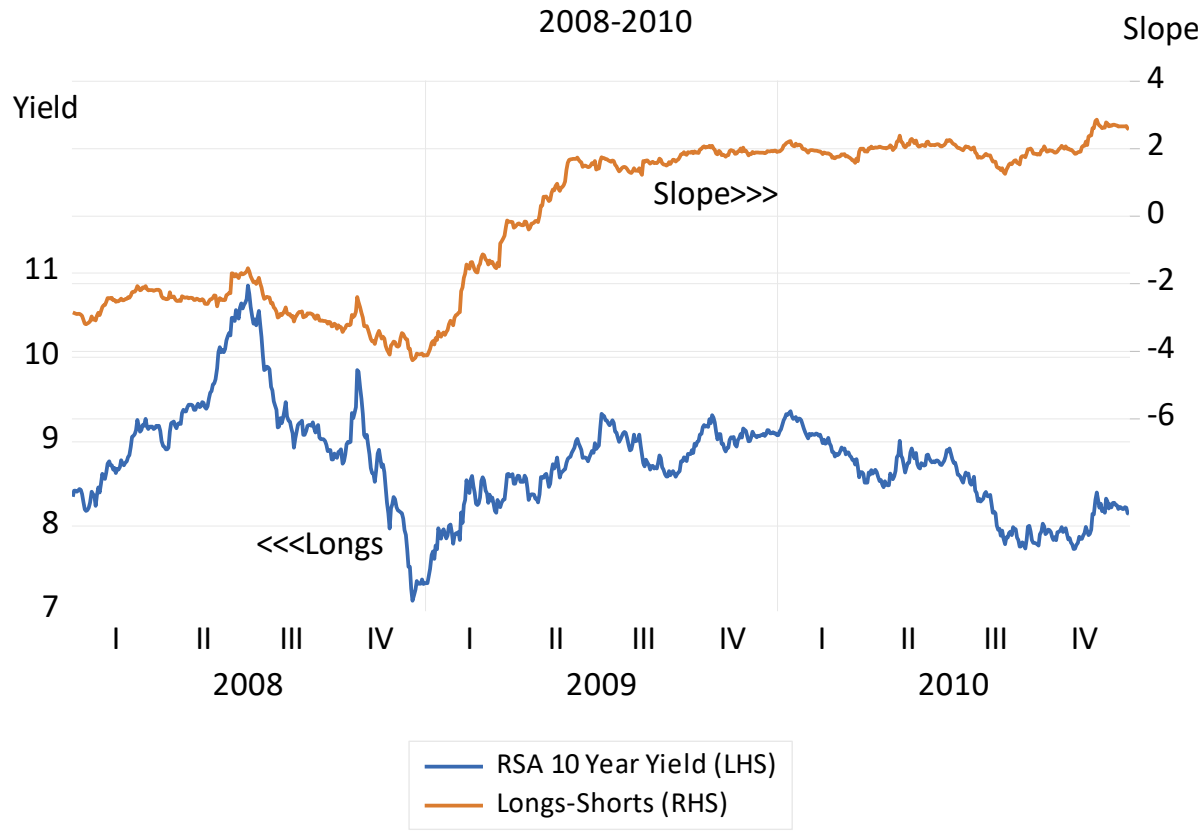
Source; Goldman Sachs Industrial Commodity Price Index, Bloomberg and Investec Wealth and Investment

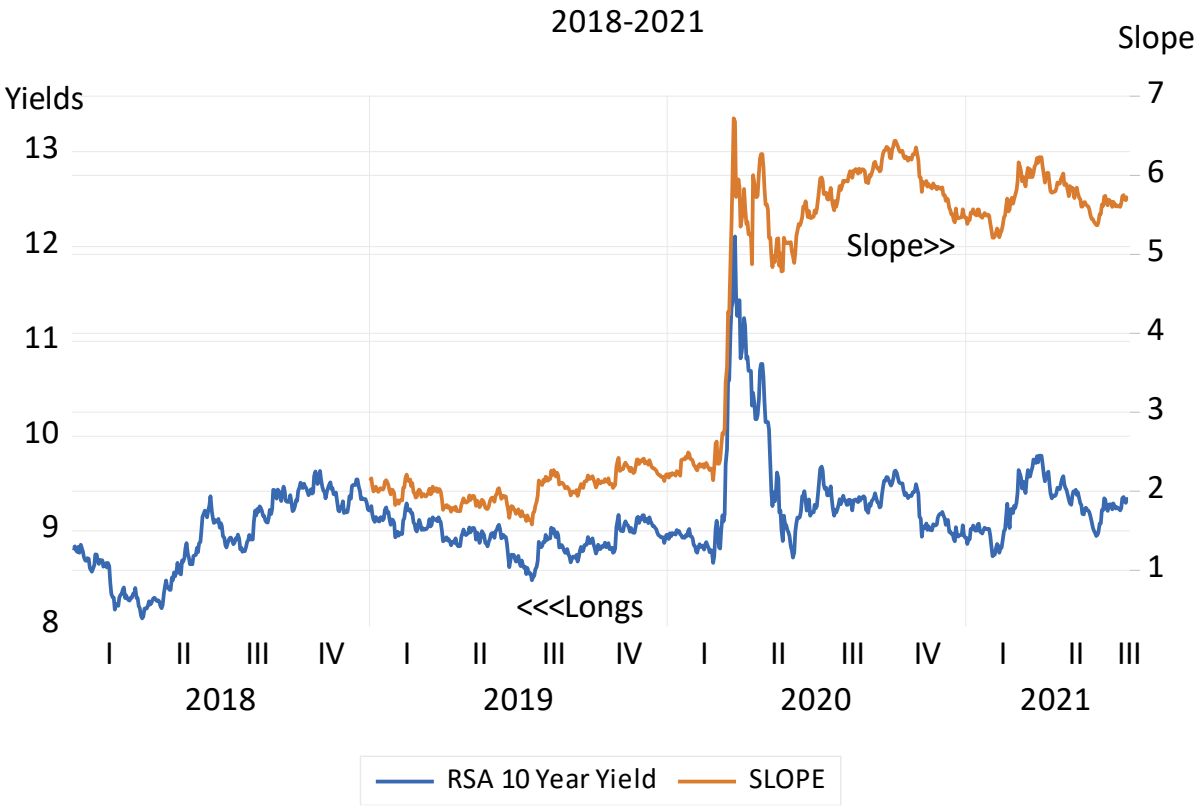
While long term interest rates in South Africa have recovered from their crisis driven extremes, they remain highly and discouragingly elevated. Discouraging because they imply very high hurdles for capital expenditure budgets to hope to leap over. Hence low cover ratios and less cash retained for capex. The gap between short and long-term interest rates, the slope of the yield curve, has moreover remained at crisis levels.

The yield curve implies that short-term interest rates will double within three years. A prospect that seems completely out of line with the outlook for the SA economy- still weakened by lockdowns -or the outlook for inflation -which unlike in the developed world is not at all threatened by the depressed state of demand in SA. We can only hope that the market has got this badly wrong.

The crisis driven SA economy should not be forced to adjust to higher interest rates- including mortgage rates. It would be inconsistent with the economic and financial stability the Reserve Bank is constitutionally charged to secure. It takes much more than low inflation to overcome an economic crisis as South Africa may still come to recognise.

Long and Short-term Interest rates in South Africa. Daily Data 2008-2010 and 2018-2021 July 21st


2008-2010
Slope
Yield
4
2
0
-2
-4
-6
11
10
9
8
7
Slope>>>
<<<Longs
I II III IV I II III IV I II III IV
2008
2009
2010
RSA 10 Year Yield (LHS)
Longs-Shorts (RHS)


2018-2021
Slope
Yields
7
6
5
4
3
2
1
13
12
11
10
9
8
Slope>>
<<<Longs
I II III IV I II III IV I II III IV I II III
2018
2019
2020
2021
RSA 10 Year Yield
SLOPE

Source; Bloomberg and Investec Wealth and Investment

Looking for a margin of safety in the market.

The prices of all assets on all markets open to global investors will tend to respond to a shock in predictable ways. As suggested, they will have a global appetite for risk in common to influence demand and supply of different securities. The different assets will all be substitutes or in the many diversified portfolios of assets held and managed by their owners or agents that is the professional fund managers. A substitute is defined as a price that rises when the price of some close alternative rises. For example, if the S&P moves higher this will increase the demand for shares registered on other stock markets, perhaps including EM markets, that are alternatives for inclusion in many portfolios. Their prices will therefore move together or apart in patterns that can be recognised and interpreted. For example, EM equities markets and the EM Index will

take its cue from developed markets, from the direction of the S&P 500. And any one EM market, for example the Johannesburg Stock Exchange (JSE) is likely to take its direction from other EM stock markets.

Recognising the deviations from the well-recognised patterns, for example from the relationship between the price of the average EM share and the JSE may well provide opportunity to an active investor holding the view that the observed disturbance, or presumed dis-equilibrium, will be a temporary one. That in other words by acting on the view that the market has mispriced some assets and that the fundamentals that determine prices and values will reassert themselves consistently when better understood.

The usefulness, the wealth adding ability of such judgments, will however also depend upon subsequent moves in the S&P and the EM Indexes. Their movements are not easily predicted and would have to move in a favourable direction to validate the active position taken. The relationships between the assets or asset classes may revert to normal and yet share prices can still rise or fall enough to vitiate any investment decision. What however can be said of an observation of the state of the markets as being in some disequilibrium, based on a close examination of past behaviour, is that the decision to buy or sell at current values enjoys a margin of safety not normally available. The presumption would be that current valuations provide a helpful entry or exit point that improve the chances of superior risk adjusted returns.

In the case study we demonstrate how such a margin of safety can be sought for investors in the JSE or SA bonds and the ZAR by observation of the highly influential role played by EM markets in the determination of the value of the JSE and the ZAR. The recognition that the rand or the JSE might be overvalued or undervalued – according to their respective models – that include the EM as important explanatory forces- provides the margin of safety or lack of it.

However, while the rand and the JSE are to be regarded as EM currencies or markets, the EM is itself not an isolated island in a sea of global capital. The EM values will themselves take direction from global forces as reflected by the prices of US equities and bonds and the US dollar. We can improve our understanding about the JSE and the USD/ZAR exchange rate by looking closely at and estimating the forces that drive the EM valuations, including the S&P Index and the US dollar.

The margin of safety in the current valuations of the benchmark EM equity index and the EM exchange rates is also of importance when the models suggest that the ZAR or the JSE is under or overvalued, by reference to past behaviour and our understanding of the past. This leads inexorably to an examination of the forces that drive the value of the S&P 500. A model of the S&P that can help determine how demandingly or less demandingly valued is the current level of the S&P would help establish the margin of safety for all the equity markets connected to the S&P 500. It is a model in which the risks to the S&P Index are included as part of the explanation. Another essential component of any such model of the S&P Index would be the relationship of current valuations to reported index weighted earnings or dividends. When the value of the Index appears as extended when compared to current earnings or dividends it may be described as

demandingly valued. That is demanding of strong growth in earnings and dividends, all other forces that determine the value of the S&P Index remaining the same. A model building exercise of this kind is undertaken below.

The economic performance of a company will determine its value. Return on capital employed is much more important than capital structure

The starting point for any analysis of any equity market exercise will be to measure the economic performance of the companies listed on the Index. The better the historical performance of a company the more value will have been attached to it over time. This is the simple theory well supported by the facts.

Valuing companies and Equity Indexes – their relationship with earnings and dividends

Reported index earnings and dividends per share, sometimes described as trailing earnings, are easily accessible, at an aggregated level, and are highly correlated with alternative measures of performance that may be used in valuing any indexed collection of companies, for example cash flows, or free cash flows, cash flows that could be returned to shareholder, or better still return on capital measures. The analysis of an individual company can well justify the disaggregation of summary statistics. Bottom line earnings can be very differently interpreted, different enough to justify much scrutiny and re-interpretation by the specialist company analyst. But such differences may well cancel out when estimating the value of an Index of companies, especially when no one company counts for more than a small share of the Index.

It is therefore logically consistent to consider the relationship between the level of S&P share values and earnings and dividends, relationships that are the subject of much market commentary. In the long run, the valuation of a company and its economic performance can be expected to converge in a consistent way and the statistics do support such a view.

The correlation between the log value of S&P earnings and dividends per share and the log value of the Index itself at month end between January 2000 and June 2021 is understandably high. (R=0.89) between the Index and the dividend flows and slightly higher (R=0.90) between the index and index earnings per share. The correlation between earnings and dividends is also very close to one (R=0.93).

Given the strength of this relationship it is not at all surprising that a simple single regression equation linking the monthly log value of the S&P 500 with the monthly log value of S&P 500 Index earnings or dividends per share provides a very good statistical fit. [7] The equation explains over 96% of the dependent variable, the S&P Index as shown below.

[7] The regression equation estimates of the model are shown below as is the test for mean reversion which is passed at the 5% confidence level

Dependent Variable: LOG(SP)
Method: Least Squares
Date: 08/09/21 Time: 07:59
Sample: 1960M01 2021M06
Included observations: 738

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.740057	0.081181	-21.43428	0.0000
LOG(SPDIV)	1.164778	0.010077	115.5891	0.0000
USGB10	-0.066190	0.003406	-19.43369	0.0000

R-squared	0.964101	Mean dependent var	5.911803
Adjusted R-squared	0.964003	S.D. dependent var	1.285121
S.E. of regression	0.243824	Akaike info criterion	0.019313
Sum squared resid	43.69570	Schwarz criterion	0.038028
Log likelihood	-4.126497	Hannan-Quinn criter.	0.026530
F-statistic	9869.534	Durbin-Watson stat	0.033200
Prob(F-statistic)	0.000000		

Null Hypothesis: SPRES has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=19)

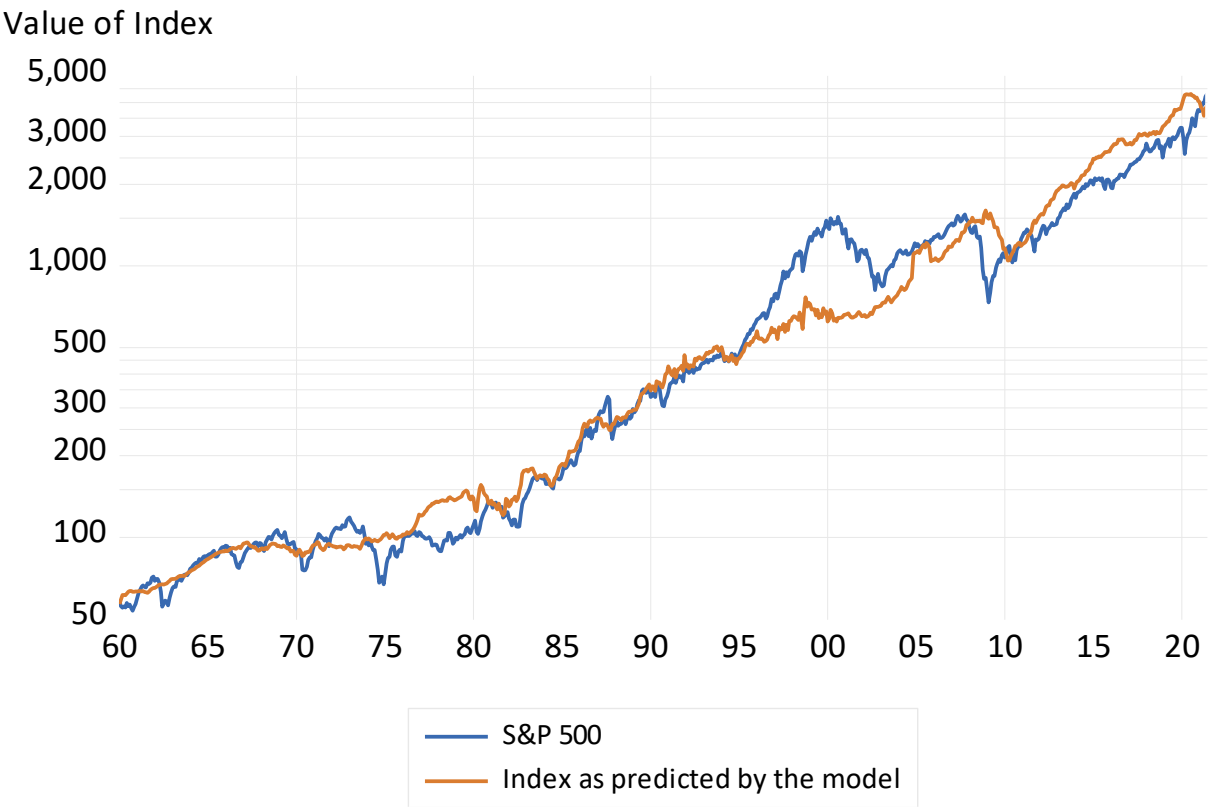
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.900660	0.0457
Test critical values:	1% level	-3.439008	
	5% level	-2.865251	
	10% level	-2.568802	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(SPRES)
Method: Least Squares
Date: 08/09/21 Time: 08:00
Sample (adjusted): 1960M03 2021M06
Included observations: 736 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

Fig.6; The S&P 500 Index and its predicted value (explained by dividends and long term interest rates)

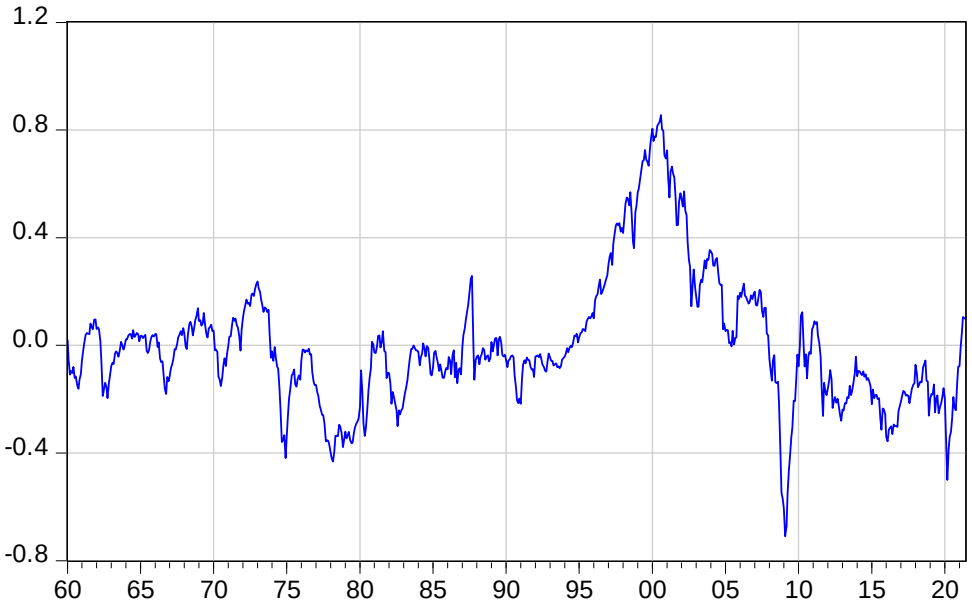


SPRES(-1)	-0.019220	0.006626	-2.900660	0.0038
D(SPRES(-1))	0.164863	0.036363	4.533845	0.0000
C	0.000184	0.001608	0.114489	0.9089

R-squared	0.035250	Mean dependent var	0.000205
Adjusted R-squared	0.032617	S.D. dependent var	0.044341
S.E. of regression	0.043612	Akaike info criterion	-3.422918
Sum squared resid	1.394147	Schwarz criterion	-3.404163
Log likelihood	1262.634	Hannan-Quinn criter.	-3.415685
F-statistic	13.39104	Durbin-Watson stat	1.993637
Prob(F-statistic)	0.000002		

The residual of the equation, that part of the S&P not explained by dividends or interest rates- with the right negative sign- is mean reverting in a statistically significant way. That is movements away from the predictions of the model, its “fair value” so to speak, have been followed by movements back to equilibrium. The residual of the model, that part of the S&P Index not explained by dividends and long-term interest rates, is shown below. As may be seen looking back the Index appears as much as 80% overvalued in early 2000. And 80 and 50 per cent undervalued at the height of the crises of early 2009 and March 2020.

Fig.7; The residual of the S&P Model. The difference between the log value of the S&P and its estimated log value



The validity of the model would have to be further examined by way of back-testing. That is testing whether the same model, when estimated at some critical point in the past, identified after the events, with data only available then, applying the same model, would have led to similar conclusions of over- or undervaluation. For an extreme example in 2000, when the market appears with hindsight to be very overvalued, some 80% overvalued and then suffered a sharp correction, would an analyst working with the same model have come to a similar conclusion? The answer in this case is a decided yes. And in early 2009 and 2020 the same model would have indicated a high degree of undervaluation.

But by 1996, the S&P would already have appeared somewhat overvalued, inspiring Allan Greenspan the then Chairman of the Fed to speak of irrational exuberance. An exuberance that would drive the market ever higher for four more years. The model should not be applied as a

trading model rather as an indication of margins of safety in current valuations. That is safety if all other variables other than interest rates and dividends remained unchanged- appetite for risk included- which may not be the case at all.

Shiller became famous and won a Nobel prize for economics using a simple 10 year moving average of S&P earnings, without interest rates, to come to the same conclusion well publicized at the time. We wrote a paper showing how the same overvaluation would also have been recognised by our modified price/dividend or earnings model, modified by prevailing interest rates, sometimes described as the Fed model. [8]

We observed earlier on the regularities accompanying an economic and financial crisis in the paper the large differences between the flow of earnings and dividends during and after the global financial crisis GFC of 2008-09 that made a 10-year moving average of earnings a poor guide to the performance of the S&P. The flow of dividends paid by the S&P listed companies, would have served better to predict the value of the S&P in the aftermath of the GFC, as they may well do so again in the aftermath of the lockdowns of 2020. A point we take up further below in our study of the regular features of the two crises for the S&P, that of 2008 and 2020.

The same consistent long-term relationship between the value of the JSE All Share Index, dividends and short-term interest rates can be observed. The fit is very good (R squared=0.97) and the residual also passes the test for mean reversion. [9]

[8] Nobel Prize Revisited: Do Shiller's Models Really Have Predictive Power? with Christopher Holdsworth, Journal of Applied Corporate Finance, Volume 26 Number 2 Spring 2014

[9]

Dependent Variable: LOG(JSE)
Method: Least Squares
Date: 08/09/21 Time: 08:46
Sample: 1960M01 2021M06
Included observations: 738

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.561563	0.058512	-43.77877	0.0000
LOG(DIVAL)	1.135926	0.006048	187.8307	0.0000
SHORTS	-0.003933	0.002592	-1.516964	0.1297

R-squared	0.979862	Mean dependent var	7.772141
Adjusted R-squared	0.979807	S.D. dependent var	2.178906
S.E. of regression	0.309625	Akaike info criterion	0.497144
Sum squared resid	70.46250	Schwarz criterion	0.515859
Log likelihood	-180.4461	Hannan-Quinn criter.	0.504361
F-statistic	17881.70	Durbin-Watson stat	0.046066
Prob(F-statistic)	0.000000		

Fig.8: The JSE All Share Index and its Estimated Value Monthly Data 1960-2021

Null Hypothesis: JSERES has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=19)

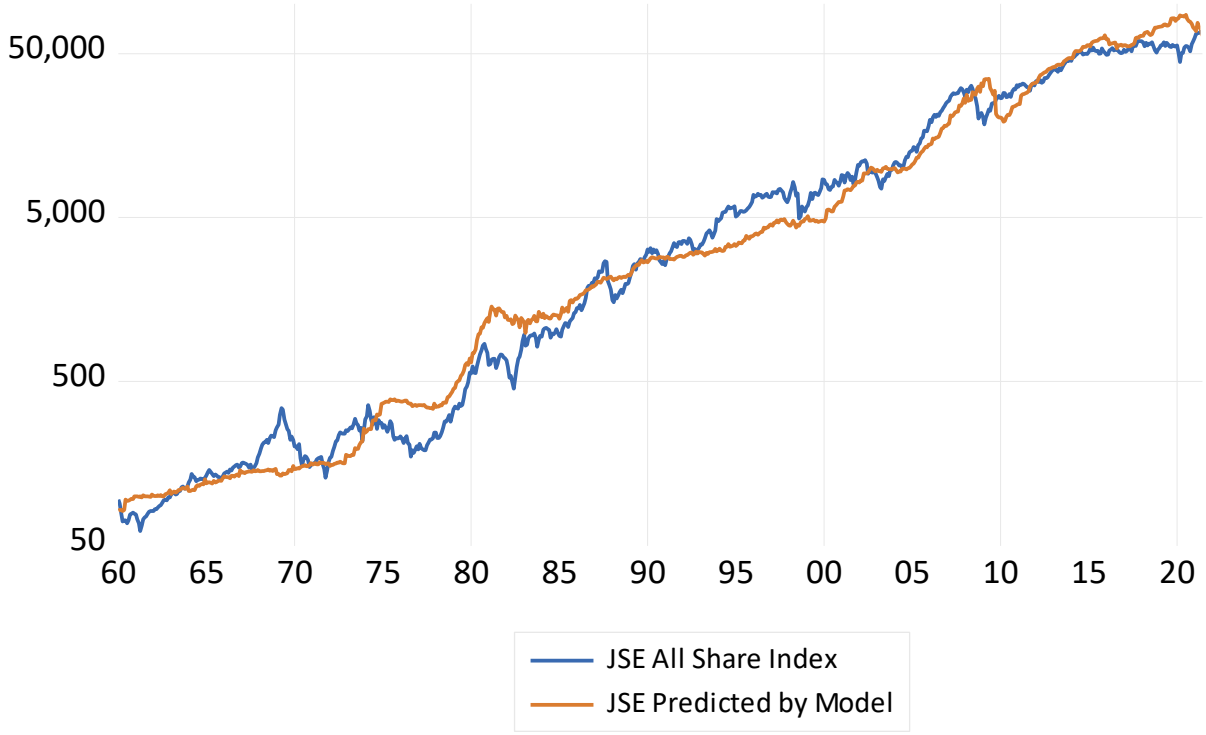
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.946855	0.0406
Test critical values:	1% level	-3.438996	
	5% level	-2.865246	
	10% level	-2.568799	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(JSERES)
Method: Least Squares
Date: 08/09/21 Time: 09:07
Sample (adjusted): 1960M02 2021M06
Included observations: 737 after adjustments

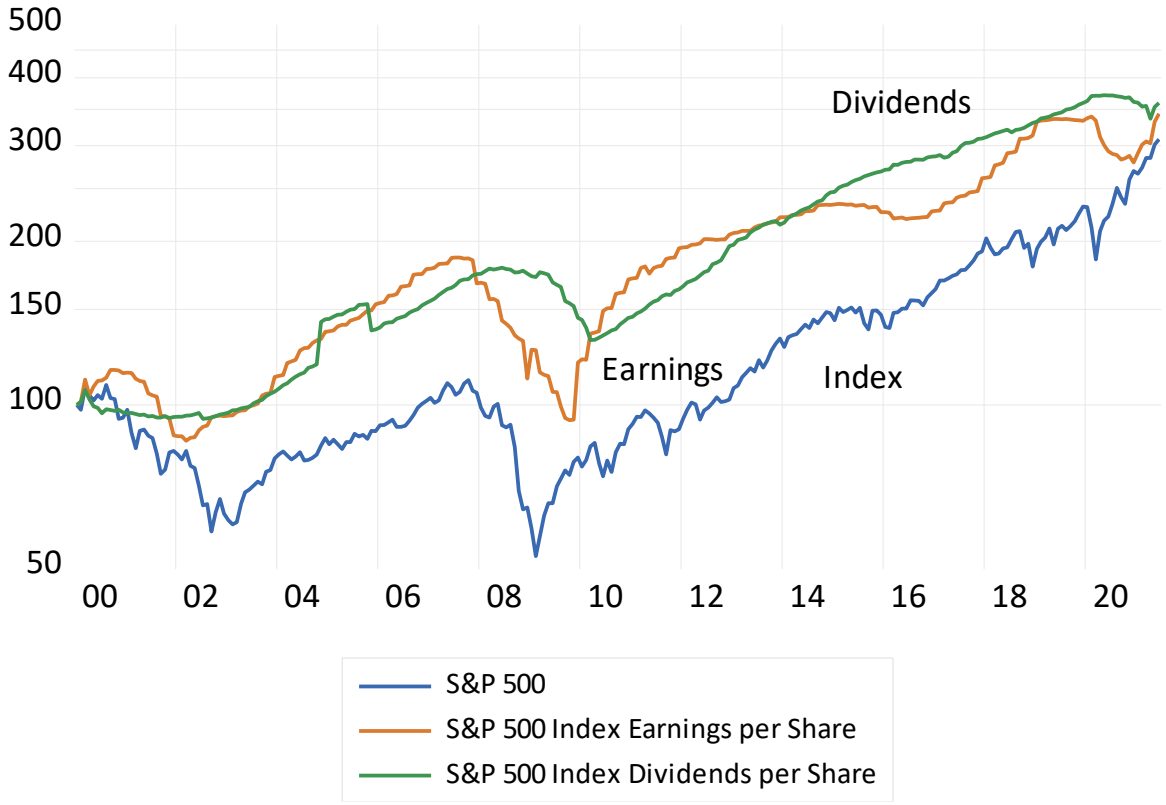
Variable	Coefficient	Std. Error	t-Statistic	Prob.
JSERES(-1)	-0.023193	0.007870	-2.946855	0.0033
C	-0.000167	0.002434	-0.068526	0.9454

R-squared	0.011677	Mean dependent var	-0.000166
Adjusted R-squared	0.010332	S.D. dependent var	0.066410
S.E. of regression	0.066066	Akaike info criterion	-2.593624
Sum squared resid	3.208037	Schwarz criterion	-2.581134
Log likelihood	957.7505	Hannan-Quinn criter.	-2.588807
F-statistic	8.683954	Durbin-Watson stat	1.819982
Prob(F-statistic)	0.003312		



S&P dividends are much smoother than S&P earnings as may be seen in the figure below. Dividends are cash paid out and are not subject to changes in accounting procedures, though they are not the only form in which cash can be returned to shareholders. Buying back shares also returns cash to shareholders. Dividends paid by companies may be regarded by their managers and directors as a measure of sustainable earnings, not to be reversed, and thus may be considered as a superior indicator of the expected earnings that drive company valuations. Dividends sharply parted company with earnings during the Global Financial Crisis and again during and following the recent lockdowns. See figure below

Fig.9; S&P 500 Index, Earnings and Dividends per Index Share 2000=100



The economic performance of any business will have a very important influence on its value over time, though it will not be all that matters for a share price. Forces other than earnings, for which accounting earnings are only a starting point for analysis, may well alter to also affect current valuations. For example, political risks to property rights – higher taxes or dangers of expropriation or value destroying regulation and risks of that kind, will show up in a higher risk adjusted discount rate to be applied when valuing the current and future performance of a company. In the case study we attempt to extend the model of the S&P Index to include other presumed forces acting on the S&P and the JSE, using daily data and annual growth rates.

It will be the expected rather than realised economic performance will determine the current value of any company to its owners or any Index of them designed to represent the average company listed. The value of a company will depend on more than earnings expected next year. It will be expected to have a much longer business life. Just how long it will take before some competitive advantage, unique perhaps to a company, will be competed away, is a most important determinant of its present value. However, such expectations will not usually be held independently of past performance, particularly for well established businesses that contribute much of the market value of any Index.

In the longer run the realised economic performance that drives the value of a company, and the expectations of future performance are very likely to converge. The so-called unicorns, very valuable companies with very little by way of past performance to rely on, but with lots of promise, are very much the exception to the rule. They will be given time to justify their valuations.

The importance always attached the most recently presented set of financial statements is because of what the news may reveal about the future of the company. Earnings surprises may indicate that information about the long-term future of a company may have been misunderstood, calling for a reassessment of the value of its future operations. These issues were discussed in the previous chapter.

Linking the wider economy with the financial markets

The earnings or profits of companies included in the S&P 500 Index will depend over any extended period mostly on the state of the US economy. If one could predict the level of the US nominal GDP in say twenty years, one would be able to predict the earnings delivered by the S&P 500, in the same money of that day, with some confidence, and in turn be able to derive an accurate estimate of the S&P 500 Index.

It is earnings that link the real economy to the valuations of companies and explain the role played by the economist in the financial industry, charged with forecasting the economy and hence the earnings of companies that will be valued by the share market. There has been a theoretically highly plausible and consistently strong relationship over the long run between the economic performance of companies and their market value as was demonstrated above.

It is not coincidence because it is the companies that account for a large proportion of the value added or GDP of an economy. As we show however the share of profits in an economy, in the value added by the business sector, has not been a constant. This complicates the relationship between GDP and share prices. Though competition can be relied upon to compete away what would be regarded as excess profits over time. A long-term tendency to normal risk-adjusted returns and normal operating profit margins to deliver them can be assumed about any company and the collection of them that make up an economy. What however may become the norm for expected risk adjusted returns may not be a constant. They will tend to rise with growth rates and increased demands for capital. They may also rise because the risk of a debilitating or

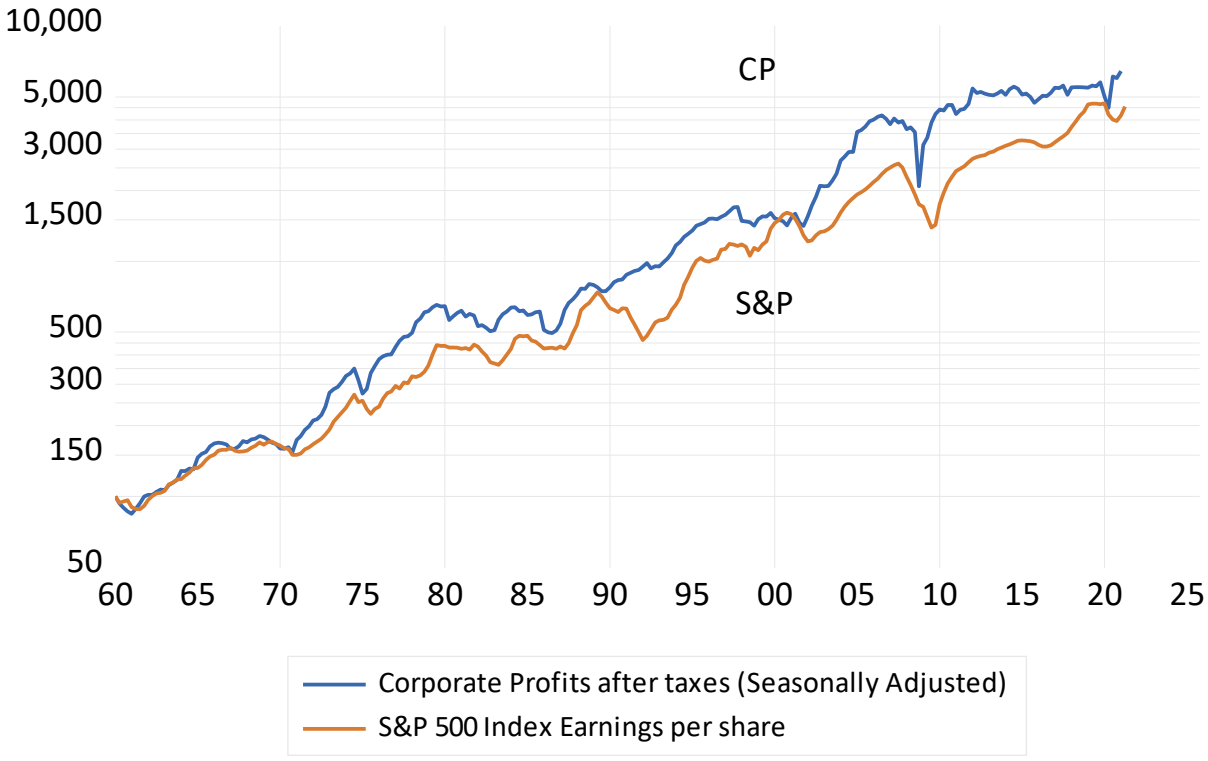
enhancing set of economic policies may rise or fall. Predicting such important changes in the structure of an economy that will influence the relationship between current economic performance and the value to shareholders of the companies currently delivering performance is a complex task facing the forecaster.

As shown below in figure 11, the share of corporate profits in US GDP is currently much higher than it was before 2000. The reason for this may well lie in the growing importance of intellectual property in the determination of national and corporate income. And the growing importance of information technology led by highly profitable and large IT companies. Their capital may well be better protected against competition than more traditional, tangible capital, plant, property, and equipment employed by firms in the past. But if so, their operating profits are vulnerable to intervention by the trust busters and their modern like.

Predicting interest rates at that future point in time would improve the forecast further. However the level of interest rates, adjusted for inflation, will not be determined independently of the state of the economy. The faster the growth rate the more competition for savings and the higher will be real interest rates.

The correlation between the national income measure of corporate profits in the US and S&P Index earnings was very high (R=0.91) between 2000 and 2021. Close to a one-to-one relationship despite the revenues and profits generated by the offshore operations of US companies, that would not form part of the US GDP. The incomes of the largest listed companies clearly account for a high proportion of the profits estimated by the national income accountants in the US.

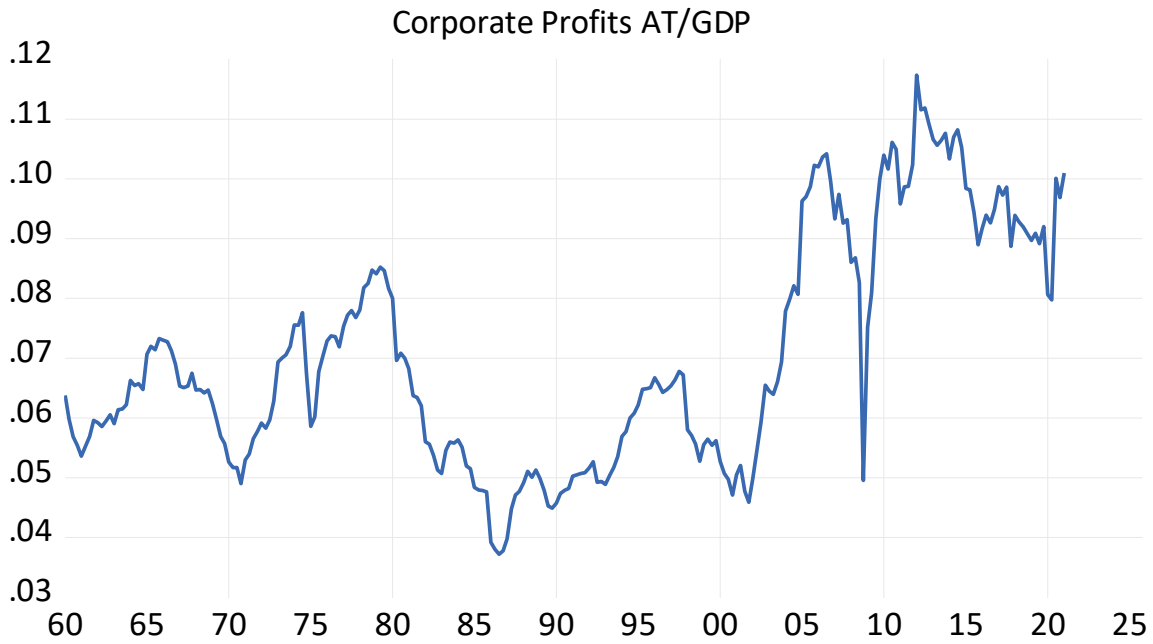
Fig.10; US Corporate Profits after taxes and S&P 500 earnings (1960=100)



The relationship between the GDP and the share of profits in the GDP, as mentioned, has not been constant. The share of corporate profits in GDP increased significantly after 2000, fell away sharply during the GFC of 2008-09 and has rebounded to pre-crisis ratios in 2021 as may be seen in figure below. Profit margins explain this ratio.

It would appear from the increased share of corporate profits in the US GDP, that US companies have become more profitable, per unit of revenue or output, over recent years. A factor that would justify higher valuations, if regarded as sustainable, and would also justify retaining more of the earnings generated, which also appear to be value-adding, as we discuss further below and in the case study.

Fig.11; US Ratio of Corporate Profits after taxes to GDP 1960-2021



The relationship between short term growth rates in the economy and the performance of companies and markets is highly variable. The conundrum facing any economist. Predicting GDP growth rates is not enough to not make you a successful active investor.

While it will be agreed that in the long run the economic performance of a company or Index of them will determine its value. It may also be agreed that the economic performance of the companies listed on a stock exchange will depend on the state of the economies they are an important part of. Provided that is the stock market Index is representative of the companies that make up the economy. The performance of an economy, the incomes earned and the share of profits in income, will run in the same long run direction, if the past is a useful guide. Forecasting earnings and with them the value of the stock market becomes dependent in large measure a matter of forecasting the growth of an economy.

However, the long run state of any economy or company is made up of a long series of much shorter runs. Short run performance will inevitably be closely examined for its clues to longer run performance. The focus of attention of analysts and investors therefore is on the most recent

information about an economy or a company. Such information will usually be converted into growth rates. For example reporting the growth of GDP or company earnings or dividends that are usually updated on a quarterly basis.

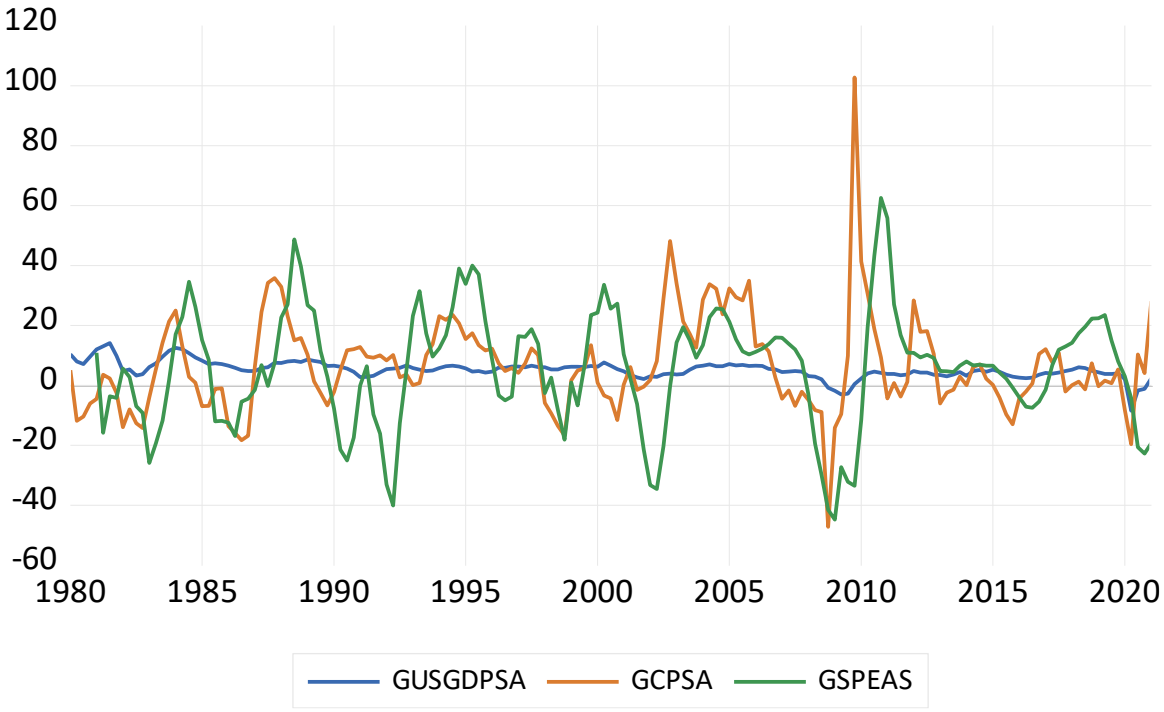
Growth rates are however highly variable, and they vary more as the period over which growth is measured is reduced. As mentioned, share prices, among all other market determined prices or interest or exchange rates change randomly from day to day or even hour to hour. Any sense of whether the prices are drifting higher or lower over a more extended period can only be gained by smoothing the data, that is looking at the change in prices over an extended period. Perhaps for as long as a year, should monthly or quarterly movements also appear as highly variable and hard to interpret, which they are likely to do.

Annual growth rates, that is comparing levels of the market or the economy with the levels a year ago, are highly smoothed data. These quarterly growth rates, presented as a sequence of year-on-year comparisons as updated, have much overlapping data and give an appearance that the time-series observed has a regular cyclical character. Growth rates measured this way appear to trend in one or the other direction, persistently higher or lower, until they reach a peak or trough, and then trend in the other directions. Predicting a peak or trough in the GDP or related earnings cycle could then be regarded as useful leading indicators of a longer-term trend in share prices.

However recognising such a persistent trend in growth, identifying a persistent growth cycle under way that is driving the levels of GDP or earnings higher or lower for some extended period, may only be possible with smoothing, that is with hindsight. The economic trends would be your friend in forecasting the future if only the trends themselves were obvious at the time the news is reported, which they may not be.

We report on these growth trends below. As may be seen in figure 12, the national income and the business earnings smoothed growth cycles are much more variable than the growth in nominal GDP. Their average growth rates since 1980, calculated as year-on-year percentage changes on the same quarter of the previous year are similar, while the amplitude of the cycles is markedly different.

Fig.12; USA; Annual growth in GDP, Corporate Profits after Taxes and S&P 500 index earnings per share Growth (Y/Y) calculated quarterly

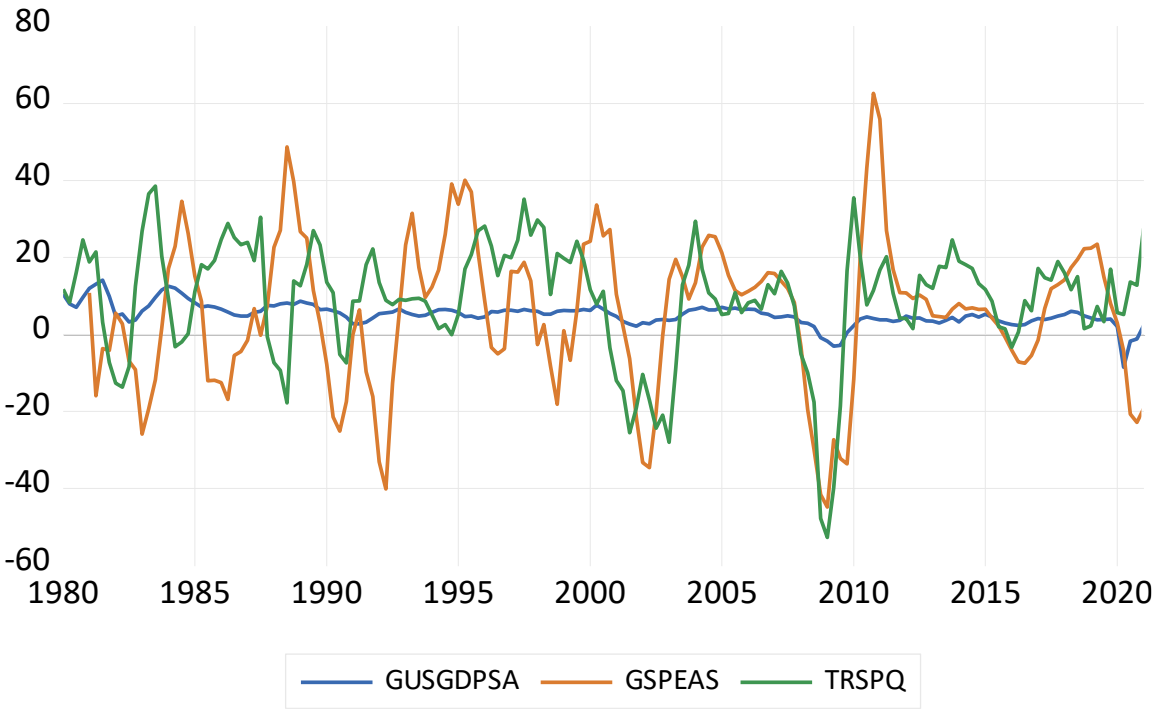


GDP growth in current prices (nominal GDP) has averaged 5.1% p.a with a standard deviation (SD) about that average of (2.8), The average growth in corporate profits was 6.9% p.a. (SD 15.9) and the average annual growth in S&P 500 earnings was 5.5% p.a. (SD 19.2) It appears moreover that the wider company earnings cycle leads the national income profit cycle, for time of reporting reasons, and perhaps because of a different treatment of provisions for bad debts and the like by the national income and financial accountants.

The simple correlation between the US GDP and corporate profit cycles was rather low on average, (R=0.14) but higher with the S&P Earnings cycle (R=0.35) while the correlation between the growth in the two profit series is only (R=0.17) Clearly there is a fair degree of slippage between nominal GDP and nominal earnings growth so calculated. Predicting the state of the business cycle or the earnings cycle will not, it appears, have provided an accurate forecast of the growth in earnings that presumably would be the objective of the exercise.

The further complication for the top-down analyst trying to link the current performance of the economy with the performance of the share market, is that there is also further slippage between GDP growth and share market returns, and between the return cycle and the earnings cycle, as shown below.

Fig.13; The GDP, earnings and return cycles. Quarterly Y/Y growth rates



S&P total returns since 1980 have averaged 9% p.a. (SD=15.2) while the simple correlation with these annual returns and the GDP cycle was not a high one (R=0.32) The correlation between the S&P return and S&P earnings cycles was lower (R=0.19) Clearly there has been much more to S&P returns than the GDP or earnings cycles that economists might be asked to predict. The correlations after 2000 between the return cycle and the S&P cycle have been higher (R=0.50) while between the growth in dividends and S&P returns the correlation was only (R=0.17). The correlations of the growth rates however improve significantly at lags 3 and four quarters, with returns leading rather than following S&P earnings and dividends. That is returns help predict earnings more than the other way round, as the theory might have it.

The correlations between the S&P return and earnings cycles, calculated as year-on-year growth rates improve slightly at three or four quarter lags- with returns again leading earnings. The correlation between dividend growth and returns improves significantly to about (R=0.4) at lag five quarters – with returns leading dividends.

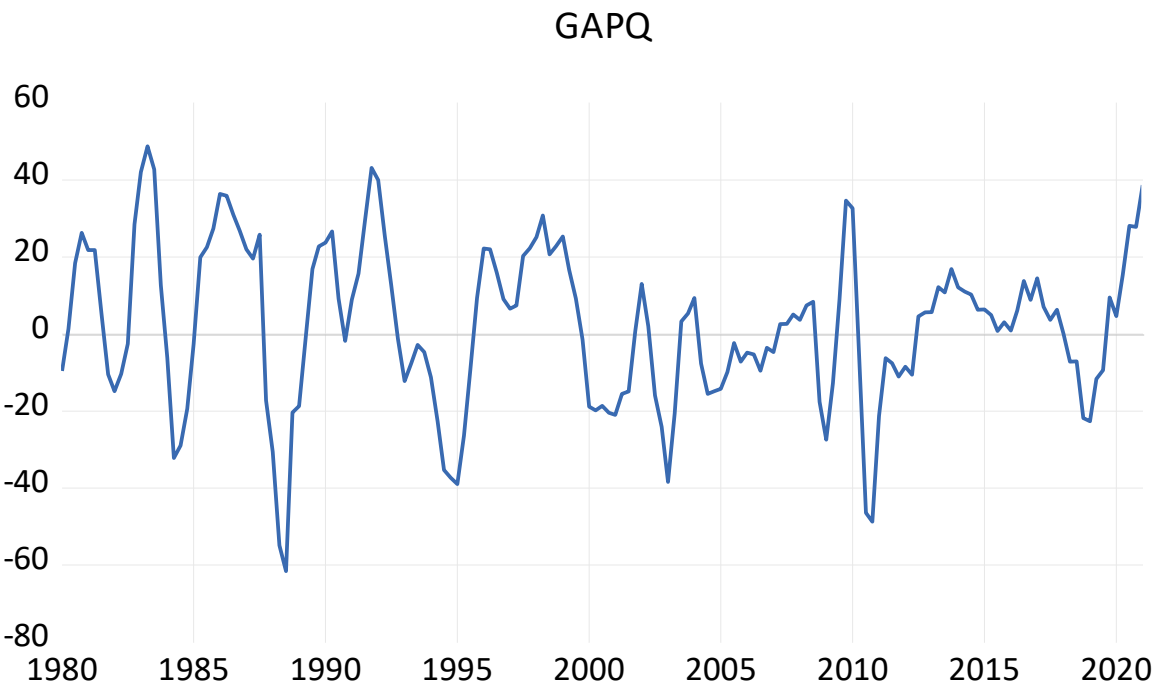
Clearly it is expected rather than realised earnings or dividends that move markets – hence the focus of market commentary on earnings surprises- the surprises that the active investor or trader will try to anticipate.

The gap between the return and earnings cycles

One consistency however to be noticed is that the differences between the return and earnings cycles narrows over time. The gap between the return and earnings and dividend cycles tends to

be mean reverting as we show below. It passes the unit root test for stationarity with a very high level of confidence. Hence perhaps justifying the attention paid to price earnings multiples.

Fig.14; The difference between the annual growth in S&P Return cycle and the S&P earnings Cycle.



However, the time it takes for the gap to close varies as we show below is variable enough to preclude utilising the changing gap between prices and earnings cycles as a trading rule. Recognising the gap between the return and earnings or dividend cycles may also help to identify a margin of safety when entering or leaving the market. We show below how it possible to go beyond dividends or earnings to gain a fuller explanation of the behaviour of the S&P 500 and by so doing establish a margin of safety with more confidence.

Explaining the slippage between the return business and earnings cycles.

The reasons for this slippage between the business and stock market cycles deserve most careful consideration. As discussed, the economic cycle that matters to the investor is the expected rather than the realised cycle. The investor is forward rather than backward looking. Thus, differences between expected and reported growth rates (earnings or GDP growth surprises) may move markets more than the latest reports themselves. Surprising reports on the state of the economy, as of the state of a company, may imply a different long-term trajectory for the economy and the profits companies ae expected to derive from these trends.

This makes timing entry or exit from a market more dependent on successfully anticipating growth surprises, rather than on the growth rates themselves, which if accurately forecast will have been well captured in current valuations. Another way of making this point is that it is more helpful to know when the market expects the GDP or earnings cycles to peak or trough, than to know when they will have reached a peak or trough. Facts that can only be known after the event when the backward-looking GDP or earnings reports are printed.

Consistency of the cycles is in the eye of the beholder- or rather the statistician

Furthermore, the latest reports on the economy are usually presented as quarter-to-quarter movements in GDP seasonally adjusted and annualised. Growth measured this way is much more variable than year on year growth rates and are accordingly harder to interpret. Reports on earnings growth and returns are for that reason mostly interpreted as year-on-year growth rates, which are highly smoothed, overlap and are therefore better correlated than q to q growth. Recognising and updating a trend from these updated quarter-to-quarter changes, as they are reported, will never be obvious.

Hence economic and financial history is written with highly smoothed data. Actual market timing and market moving decisions adjust to the raw news, as it is presented, making market prices more variable than might seem justified, looking back at the smoothed growth rates.

The notion of a business or share market cycle, one where growth rates this quarter are expected to be highly correlated with growth the quarter before is nevertheless widely accepted, even if it is very much an artifact of statistical convention designed for a different purpose, that is explaining what has happened in the past rather than as a useful guide to future developments.

As indicated this cyclical nature only becomes evident well after the event when growth rates are smoothed. As was also indicated even the historical correlation of the different smoothed growth rates is not very strong. They are still weaker when the growth rates are compared under the alternative growth convention- as quarter-to-quarter growth as shown below.

A comparison of growth rates under different conventions.

The differences in growth rates under the different conventions are illustrated below

Fig.15; Comparing growth in US GDP at current prices (Seasonally Adjusted) under two conventions. Y/Y or q-q annual growth % p.a

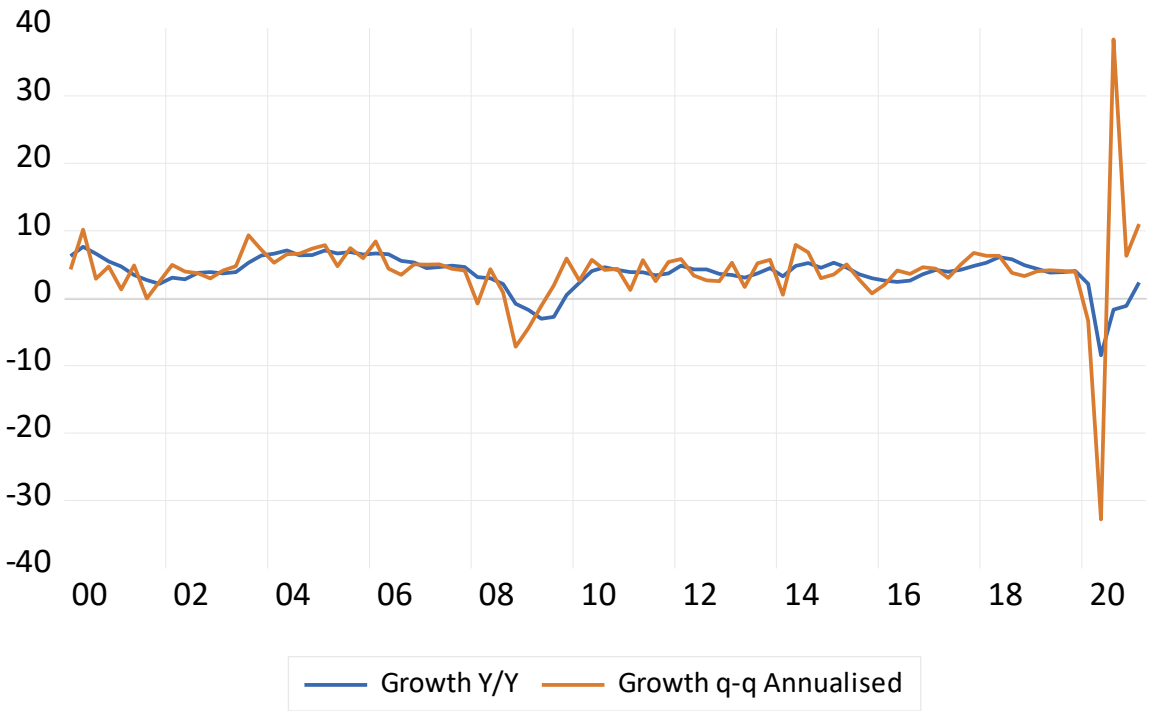
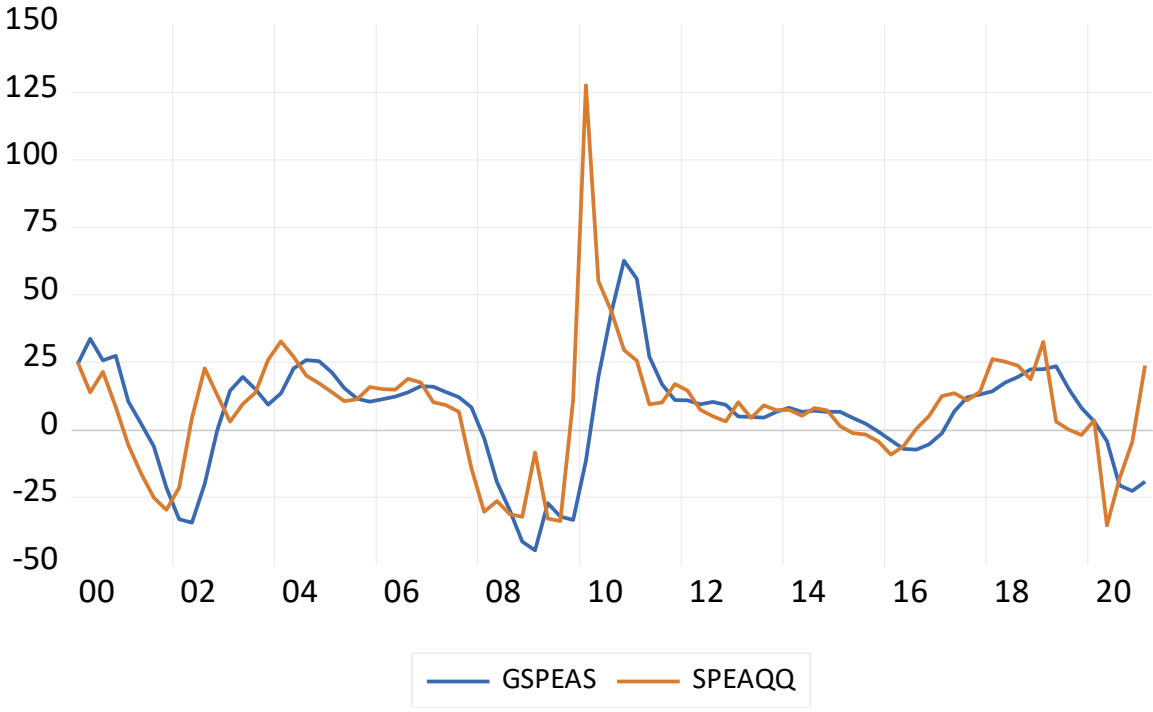


Fig.16; Comparing growth in S&P 500 earnings per share US GDP at current prices (Seasonally Adjusted) under two conventions. Y/Y or q-q annual growth % p.a.



The relationship between the US economy and the S&P 500 measured as quarter-to-quarter growth rates, is not highly correlated and some of the correlations even seem to run in the wrong direction. Perhaps it is the result of different reporting lags. For example between 2000 and 2021, the correlation between quarter-to-quarter movements in the share market and the GDP is a negative (R=-0.11) and the correlation between q-q changes in reported earnings and the index is also negative (R=-0.23) The correlation between quarterly movements in the national income estimates of quarterly movements in corporate profits after tax and the quarter to quarter Index returns per share is by contrast a positive (R=0.32) while the correlation between changes in reported Index earnings per share and in the national income estimates is close to zero.

The correlation between q-q changes in the national income estimates of corporate profits and the nominal GDP is positive but low, only (R=0.31) Accurate forecasts of the next GDP print therefore would not have helped much to forecast the stock market.

Correlations of quarter-to-quarter growth rates, US GDP(USGDPSAQQ) S&P Earnings (SPEAQQ) Corporate profits as per national income accounts (CPSAQQ) and S&P returns (TRSPQQ)

	TRSPQQ	USGDPSAQQ	SPEAQQ	CPSAQQ
TRSPQQ	1.00	-0.11	-0.23	0.32
USGDPSAQQ	-0.11	1.00	0.23	0.31
SPEAQQ	-0.23	0.23	1.00	-0.03
CPSAQQ	0.32	0.31	-0.03	1.00

From the expected future to the present reality – rather than the present to the future

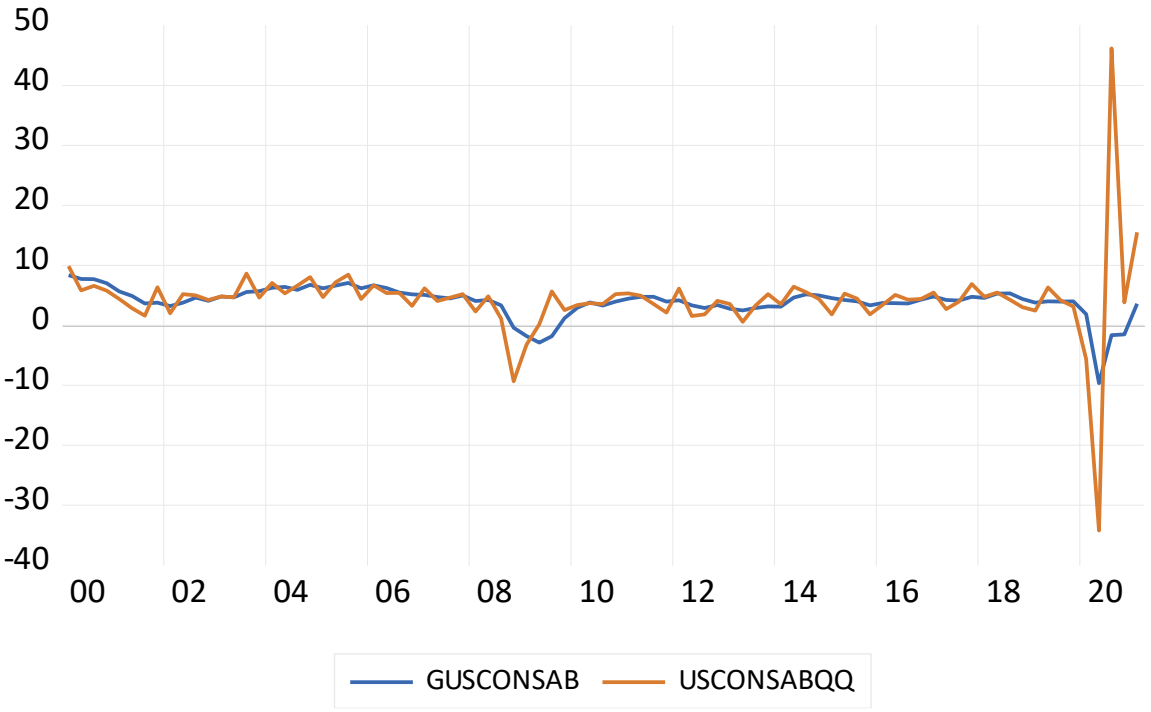
The spending decisions taken buy households and firms clearly drive the economy forward at a faster or slower pace. However, such decisions to spend are not simply dependent on past incomes. The ability to save and borrow makes it possible to relieve the constraint of current incomes on spending. Current spending and borrowing and lending decisions therefore depend on expectations of future income as well as being constrained by past income. Such expectations are held with degrees of confidence in the income prospects of the households and firms that can vary with the economic and political news.

The more confidence households will have in their income prospects, the greater will be the willingness to spend more, and businesses will respond accordingly and adapt their spending plans accordingly. Hence current incomes and output are dependent on even harder to forecast expectations of future income, and not only on past incomes, but that are also reported with something of a lag. Consumption spending by households, that accounts for about 70% of all spending in the US, is particularly vulnerable to confidence shocks in both directions, as we show in the figure below. Shocks that reverberate through the economy and that make surveys of consumer confidence worth watching closely as a potential leading indicator of the economy. Indeed consumption spending itself may be regarded as a good proxy for the wealth that drives spending. With wealth defined as the present value of all expected returns, those earned from tangible assets and expected from future employment. But if wealth itself is a random walk, responding to the random shocks provided by the economic news, the scope for forecasting the production and spending shocks that drive an economy faster or slower seems very limited. [10] I joined with two outstanding statisticians to offer a very sceptical view on mining the data in the hope of better short-term market beating forecasts.

It is the future conscious nature of economic decision making, an unknown future, that so complicates the task of predicting where the economy is going and how asset values might respond to the news. For the investor able to tolerate risk and take a long run view, the implication is surely to ignore the short term, the noise that traders rely upon to move the market temporarily in one or other direction, with less or more volatility, depending on the news and its implications. Not to attempt to time the market but to spend as much time in it receiving the extra returns on offer to the risk bearers. And to diversify the exposures, not only by choosing a variety of shares to own, but by investing in a variety of countries whose economic policies will not be perfectly correlated. One may end up an economic refugee from your country of birth, but it would be much better to end up as a well-heeled refugee. It takes living in what may well become a failed state to have thoughts of this kind.

[10] **GDI Barr[10], TJ Stewart[10] & BS Kantor[10] Time-series-based Financial Analysis led us down a blind alley – could Big Data Analysis repeat the same mistake? Journal of Applied Corporate Finance**

Fig.17; Growth in US Household Consumption Expenditure under the two conventions.



Take economic profits more seriously even than accounting profits.

The difference between earnings as reported by the accountant and recognised by the economist depends on the treatment of equity capital. The accountant treats equity capital as free to the company, unlike capital in the form of debt that carries an interest charge that reduces bottom line earnings and taxes. Thus, the more equity capital employed the greater the reported bottom line earnings, all else remaining unchanged in a valuation model. The economist attaches an opportunity cost to equity capital. The cost of this capital is the returns the shareholder would expect to earn on the capital invested elsewhere in similarly risky operations.

True economic profits, profits that are of clear benefit to shareholders, and are valued accordingly, are those that provide a return to shareholders that covers the full costs of all the capital employed by a company, both debt and equity capital. The amount of capital gainfully employed by a business is much more important than the mix of capital to its owners. Financial engineering is a limited source of benefits for shareholders, and it comes with risk. Return on

capital, properly measured, that exceeds its opportunity costs is the source of economic profit that adds value for shareholders.

It would be a rate of return that also covers the implicit cost of equity to the business and the opportunity costs of the assets of the company that could be disposed of. They may well stand in the company's books at their much lower book or historical value, rather than their current market value, so understating the capital employed by the company for which a charge should be recognised to calculate true profitability.

There is nevertheless an important distinction between debt and equity capital. Equity capital is permanent capital, it cannot be recalled, and may offer the company more opportunity to take the long view on the projects it undertakes. Debt capital is thus riskier, but if the company can return more than the interest cost of its debt, the return on its equity capital will be enhanced. More risk can be accompanied by increased returns. And only hindsight can confirm whether the risks of debt were worth taking. Though when valuing a company based on its future operations and its exposure to risk, including the risk of defaulting on its debts, the more perceived risk, the higher will be the expected returns, and the lower the value of the company for any predicted operating profits to be generated over the life of the company. These issues were raised in Chapter 9.

The complicating role played by interest rates and monetary policy in the share and other markets of the economy

Interest rates, that is the rate at which expected profits are discounted to establish the present value of a company as reflected in share prices, will also be affected by the real economy. A stronger economy will encourage expenditure on capital equipment and increase the demand for working capital. It will increase the demand for capital, from firms and households. Central banks become much more likely to raise interest rates when the real economy is exercising it growth potential and to lower them when the economy is operating below its potential.

Thus, there are causes as well as effects of higher interest rates. The cause of higher interest rates may well be a stronger economy and the profits that come with faster economic growth – a value adding development- perhaps offset to a degree by the higher interest rates - with which these higher expected profits are discounted. It may be difficult for the analyst and observer of the economy to disentangle these causes and effects of higher interest rates in a model of the stock market.

Inflation is a further complication when assessing the influence of interest rates. Interest rates can rise, but can lag behind the inflation rate – and if so, will further encourage spending rather than help to slow it down. Lower real interest rates in such circumstances will be stimulating more spending and the economy rather than slowing it down – to add to the growth in real earnings.

Usually, more inflation will accompany a booming economy and less inflation an economy in recession. Higher interest rates become more likely when inflation is accelerating and vice-versa. Inflation however also brings with it the risk that monetary policy may come to err on the side of austerity, in the attempt to bring inflation back under control, which will not be helpful to current share values. Loose monetary policy today may well be expected to be followed by overly tight monetary policy tomorrow- which would also not be helpful to the share market today.

Monetary policy was discussed in detail in earlier chapters. The link between the exchange rate, interest rates, inflation in South Africa was closely examined. Understanding the actions and reactions of central banks commands constant attention and commentary from investors and the economists and strategists who advise them. The share market and the exchange rate will reflect the judgments investors are making about the policy intentions of the central banks. And the exchange rate in an economy open to foreign trade will influence the inflation rate and in turn interest rates. Central banks in turn are well-aware of influencing the expectations of investors in ways that will be helpful in achieving their goals. Much attention is given by participants in financial markets on the thoughts and pronouncements and intentions of central bankers.

Exercises in scenario building

My first professional engagement with the financial industry goes back to 1980. I was approached by Dixie Strong one of the partners at Simpsons, a well-established stock broking business in Cape Town, to do economic and market forecasting for them and to publish the work for their clients. The forecasts were made with the considerable help of colleague Graham Barr. Being 1980 with the gold price very much on the run we ran scenarios for them predicated on different gold prices. The range of gold piece assumptions we made were very wide consistently with recent action in the gold market. An assumed gold price, a hundred dollars an ounce higher or lower than the prevailing gold prices, drove the scenarios. The interest, inflation and growth rates would follow consistently from the assumed moves in the gold price.

I still like the method. Think about the best that might happen to an economy or a company and think also about the worst of the possibilities and gain an idea of the difference it could make. It does help to appreciate the risks to any plan – both upside and downside risks. Managers of a business should be asked the same question, asked to describe what the best imaginable set of circumstances for the company could look like- the best case and the worst.

At about the same time I was invited by Shell in SA to participate in their scenario building exercises built about oil price assumptions. Shell were pioneers in scenario-based planning exercises. Given the subsequent lower direction of the oil price that had increased so dramatically in the eighties none of the scenarios we addressed in that seminar included an oil price as low as it was to fall that decade. Scenario builders need very active imaginations.

I remember well that at the time Anglo-American, very much *the* gold mining and finance house in SA at the time, commissioned an expensive opinion survey from a leading US statistician – I remember his name - Woody Brock - on the likely direction of the gold price. The mean estimate based on the survey responses was well above the then highly elevated gold prices that had risen so dramatically between 1970 and 1980. The distribution of the price forecasts moreover had a pronounced skew to the right- hand tail.

It was not to be – the gold price did not turn out to be anything like the predictions of the experts. Their expectations were highly extrapolative of recent inflation and gold price trends - which surprisingly to much considered opinion, reversed in the eighties. The scenarios should cover all bases – but they may not do so – given importance attached to the most recent developments – of expectations anchored by recent experiences especially when prices have moved sharply higher or lower.

A good grip on the fundamentals driving the markets is especially helpful when the ducks are quacking and are being well fed. Higher prices – all else remaining the same- should discourage buyers and encourage sellers- and vice versa. But this does not always happen that way. Higher prices may well encourage buyers and lower prices discourage them. Especially when there are no valuation fundamentals in the form of potential income streams to estimate, as is the case with the price of gold, or in its modern incantation, a bitcoin. They are driven by recent momentum and there is no way of judging when that momentum will turn in the other direction. It is a form of gambling without any form – or statistics - to guide. One only hopes that the gambler puts limits on the potential losses- potential losses that rise with higher prices. Furthermore, that the capital they are gambling with is their own, not that of the firm they are working for. Or when it is shareholder's capital put at risk that there are strict limits to the size of the bets taken and a close record kept of the outcomes. Gambling when you can share in the upside and are protected on the downside, is a very one-sided bet that risk managers must attempt to actively discourage.

Our only rational expectation of the gold price at that time and indeed still the case, was based on its opportunity cost in the form of real interest rates foregone to hold non-interest bearing gold. The theory still has some explanatory power. Though the insurance role of gold in portfolios – its low correlation with other prices and returns - has brought gold new investor attention and much higher gold prices with it.

Some concluding observations on asset allocation and timing the market.

The surprises that move markets, the economic news that comes as a surprise, the news that changes the outlook for an economy or a company, calls for interpretation and perhaps action by or on behalf of savers, wealth owners who have accumulated savings in the past, by their agents, the fund managers. The interpretations are the work of the analyst employed for that

purpose. A decision to buy or sell or to continue to hold any asset may follow the news enough to move the price of the asset.

It is not a surprise if an event, an earnings announcement or some high frequency data, retail sales or an announcement of tax revenues or numbers employed or the updated CPI for example, was widely anticipated. It is not newsworthy or market moving when expectations are simply confirmed.

The news may be such to change the outlook and prospects for any asset and the willingness of potential buyers or sellers to bid for or to sell the asset in question. In practice much of the day-to-day movements in prices can be ascribed to professional traders, market makers in the asset in question. Traders in shares bonds or currencies and derivatives of them who are continuously buying and selling, attempting to be a little ahead of where the market may settle down. Often the traders will take quick profits actively turning over the assets they buy and sell. Buying and holding is a more risky activity for which additional rewards can be expected. Trading can be a truly profitable activity for those who prove to have trading skills, who can quickly anticipate with above average success how the market will respond to the news. Hedge funds are very much part of the market making and moving process.

Without this trading and hedging activity, the markets in securities would not have the depth they do to allow the investor whose economic circumstances may have changed to exit a position or enter a new one without moving the market against them. That is having to bid up or bid down a price to adjust a portfolio. The investor may hope to get the timing of a sale or purchase right - timing that can only be confirmed with hindsight- but they should not hope to emulate the trader with an essentially very short time horizon. A short time horizon for action that will be essential, if the risks to the trader's capital employed are to be reduced

The risk averse wealth owner in essentially risky assets should be willing to take a long-term view. Short term price movements in both directions are best ignored. Large crisis driven movements in the market cannot be ignored. But panic selling or buying is not to be recommended. It appears to me that one is always too late to anticipate the large surprises that move markets a great deal. Large surprises are large surprises to all but a very few prescient or perhaps just lucky observers. As for recent examples, in the GFC, or after the initial lockdowns that so disrupted the markets. The judgment to be made when reacting to a large shock is about how the future after the shock will work out. To decide what can and will be done to manage the crisis. Will governments be able to come to the rescue as it did after the GFC or the lockdowns is the question?

The crisis may however be a crisis of government itself. A war or a revolution that takes the market completely by surprise may make any hope of recovering lost wealth no more than wishful thinking. Which becomes part of the case for diversifying wealth across different jurisdictions. On the presumption that you will be allowed to follow your wealth health abroad. Not all risks can be insured against. They must be borne with as much equanimity as is realistic. And for some events all assets are equally vulnerable to confiscation.

Not all savers are, or feel capable of, taking the risks that on a certain day in the future when they may have to cash in their wealth, its value will be unpredictable. Hence the rewards for those willing to bear risk. Wealth preservation with the prospect of realistic returns should be the goal of most portfolios. Diversification of these portfolios across different shares or bonds or indeed different economies serves this goal. It reduces risks and returns.

The opportunity to share in the profits of a well-managed business over an extended period is one of the privileges provided by a well-developed stock market to wealth owners. Identifying the well-managed company is an art form, helped by as much investment science as is available, in which a well-informed portfolio manager should be well practiced in. An emphasis on the return on capital employed by a company, and the importance the managers attach to capital allocation should be the focus of any company analysis.

A strategy of buying and holding a small stake in a number of companies best serves the purpose. That the market may have underestimated the capabilities of a few of them may be the source of above normal returns. The big wins may well more than compensate for the possible underperformers. big failures. If the investment is for the long run, then the right entry price for a share in a company, so difficult to judge accurately, will become less important over time. The sooner the risks can be taken the better the long-term results are likely to be.

All savings applied to investments in plant and equipment, and as important in the intangibles of intellectual property and human capital that are the life blood of successful businesses and that provide benefits to shareholders and lenders over the long term, are dependent for their value on social stability. Savings and investment help to promote economic development and the stability that comes with it. It takes the right rules and regulations and institutions to realise economic growth and stability that secures the protection of wealth and hence the willingness to create more of it through saving and investing. These are highly favourable circumstances to promote human welfare as they have proved to be. They are to be hoped for but not to be taken for granted or regarded as inevitable. The failure of many countries to escape poverty is testament to this.

Case Study

Following the markets in currencies and shares - from day to day or year to year. Identifying the patterns of past behaviour. A case study in reading the markets

This case studies demonstrates the material I would present to my classes attending my course The Economy and its Financial Markets. It presents my latest effort in a life-time of trying to understand the behaviour of the financial markets. It is knowledge gained to inform the investors and the portfolio managers who helped keep me gainfully employed. It is knowledge acquired in the marketplace that I have long shared with my students in a similar way as presented here. If I were still teaching my class in the Economy and its Financial Markets I would take the class through the steps in the analysis as indicated here in the chapter that would be required reading. Ideally before rather than after the lecture

It is not for the uninitiated but material that I would expect a senior class in economics with knowledge of statistics and econometrics to be able to follow- with my assistance. Perhaps it will remind the students I have taught what it was like to be in my class and what they studied. The material will hopefully also be of interest and relevance to the well- informed analyst or investor on the same eternal quest for a better understanding of the financial markets in which they participate. The analysis that follows provides a case study of how to go about the tasks of observation and interpretation of the financial markets.

Introduction

The purpose of this analysis is to identify the forces that determine the foreign exchange value of the rand (USD/ZAR) and the value of the JSE All Share Index. And to provide econometric support for the analysis. A notable feature of the movements in the JSE and the USD/ZAR is the consistently strong influence of other emerging equity markets and exchange rates on the South African currency and equity markets.

The focus of the analysis is on explaining the direction of the USD/ZAR exchange rate and of the rand value of the JSE All Share Index. But an understanding of the forces that determine the direction of the emerging markets in equities and currencies is essential to the purpose. In this regard we will trace the important influence on emerging and South African markets of the exchange value of the USD. The USD is clearly a very important force helping to determine the direction of exchange rates and equity markets everywhere, including as for example the key S&P 500 equity Index, as will be demonstrated.

The widely applied DXY measures the exchange value of the USD Vs the currencies of the developed world, a weighted average of the Euro, Yen, Sterling and the Swiss Franc. We show that USD strength, higher values for the DXY, is generally associated with emerging market exchange rate weakness, that is lower values for the Index that reflects the USD value of a weighted Index of emerging market currencies, the FXJPEMCS to give this index its Bloomberg symbol. For want of a long enough series for this EM exchange rate index we have calculated our own fixed weight currency basket (EMNEW) the composition of which is reported in footnote 7.

Explaining the Rand and the JSE

One need not go far to discover the forces that drive the observed daily movements in the daily value of the USD/ZAR exchange rate and of the JSE All Share Index. The USD/ZAR closely tracks

other Emerging Market (EM) exchange rates VS the USD11 and the JSE follows closely and consistently the direction given by the MSCI EM benchmark equity index. The South African weight in the equity index is a low one, currently of the order of only 3% while the ZAR is excluded from the basket of currencies with fixed weights that make up the EM currency Index Vs the USD applied in this study.

The relationships between the USD/ZAR and the USD/EM exchange rates and between the JSE and the Emerging Market Equity Index (MSCI EM) is shown below in figures one and two. As may be seen the USD/ZAR is very well understood as an emerging market exchange rate and the JSE as an emerging equity market as we shall demonstrate in greater detail below.

Fig.1; The USD/ZAR exchange rate and the USD/Exchange rate with a basket of other EM exchange rates. Daily data 1995-2021

[11] The exchange rates included in this nine-currency basket are those of Brazil, Mexica, Chile, Philippines, Malaysia, Turkey. Hungary, Russia and Indonesia, all with fixed weights. It purposely excludes the currencies of China ,Korea and Taiwan, the South East Asian tigers, as less representative of the EM forces acting on the ZAR. An alternative activity in the currency markets weighted index index to represents the behaviour of EM currencies is calculated by JP Morgan and is reported on Bloomberg as FXJPEMCS. This series is only available after 2015. Since then the correlation with the fixed weight basket used in our analysis is R=0.99 suggesting that for statistical purposes the two series are highly equivalent.

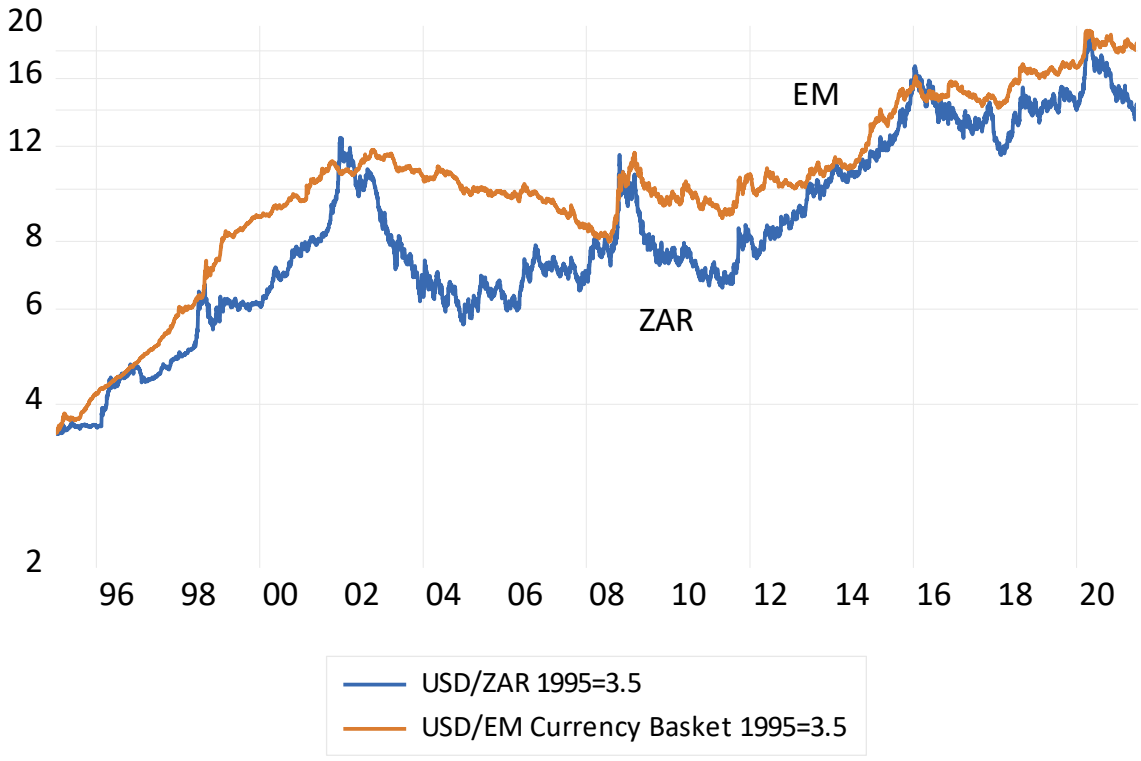
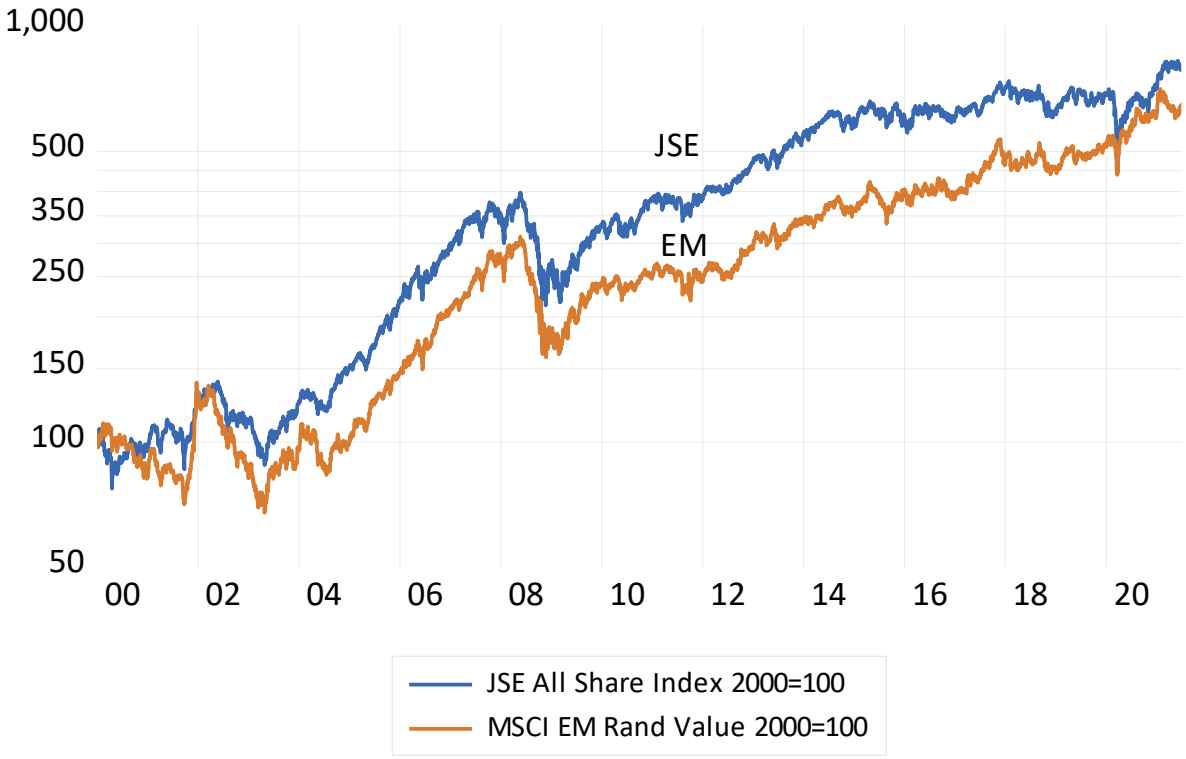


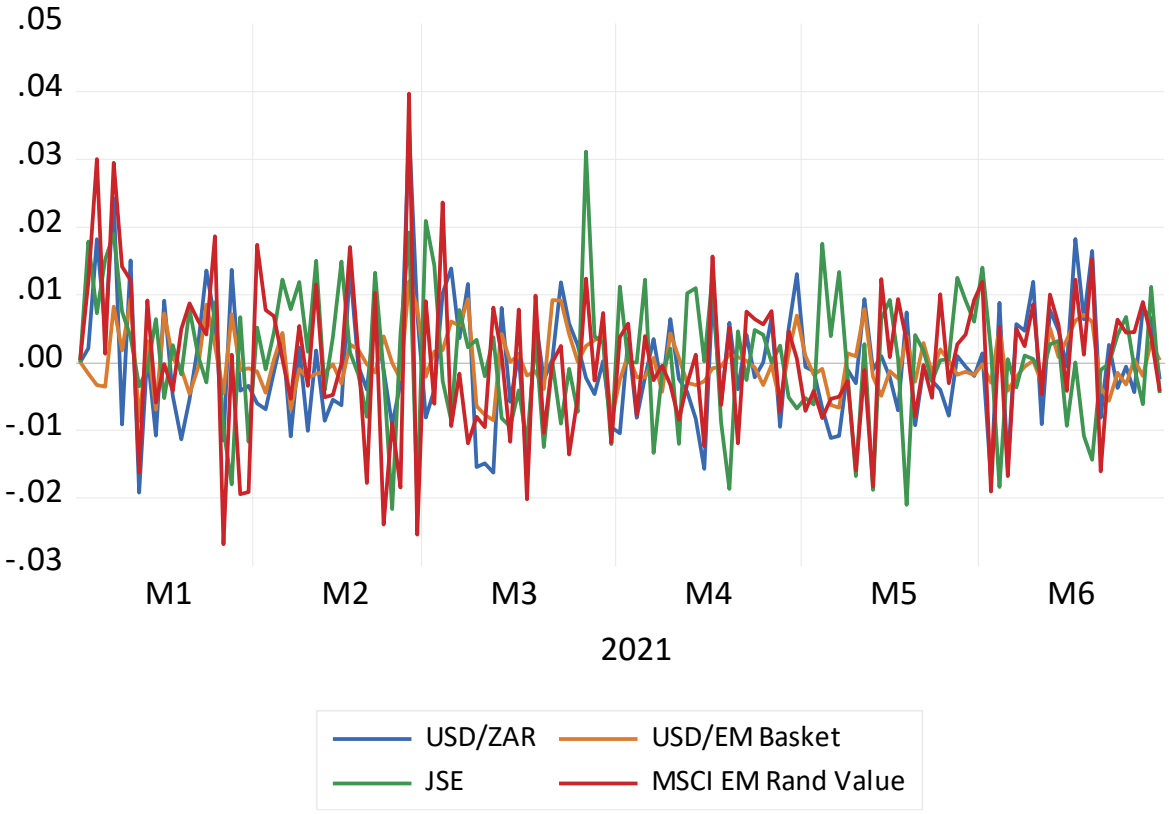
Fig.2; JSE All Share Index and MSCI EM Index (2000=100)



The simple correlation since 2000 between the daily log value of the two equity series is close to one (R=0.97) and the daily relationship between the USD/ZAR and the USD/EM Basket exchange rates is also very close to one (R=0.91) The correlation between daily percentage changes in the JSE and the EM Index in the same currency is a statistically impressive 0.51 and the correlation of daily changes in the USD/ZAR and the EM currencies Vs the USD is even higher over the same period (R=0.63) Given that the closing values will not have been recorded at the same time each day, these correlations of daily movements are particularly impressive evidence of the close connections between the markets.

The chances of the rand or the JSE rising or falling on any day are about the same and average daily movements average close to zero. The USD/ZAR is very close to a random walk as is characteristic of all well traded markets. Recent random daily movements of the ZAR, the JSE, the EM currency basket and the EM equity Index are illustrated below. It is of therefore relevant and important to recognise that these random movements are themselves strongly connected in statistically significant ways, as revealed by their correlation statistics.

Fig.3; Daily percentage movements in exchange rates and Equity Indexes



The USD/ZAR affects different sectors of the JSE very differently.

Daily moves in the USD/ZAR and the JSE are however not statistically related. The correlation between daily movements in the USD/ZAR and the JSE is close to zero (R=-0.13) This is because different sectors of companies that make up the JSE All Share Index react very differently to changes in the exchange. Companies with exposure to the SA economy benefit from rand strength and are harmed by the higher interest rates and prices that follow rand weakness and vice versa. JSE listed companies whose principal sources of revenues and earnings are generated offshore will benefit from rand weakness- other things equal. Other things equal would most importantly have to apply to global events that are associated with rand weakness or rand strength, and also with other EM exchange rates, that react very similarly to global events.

The value of Resource companies for example are unlikely to escape the impact of lower metal prices that accompany a global recession, even should the impact of lower USD prices for their metals be moderated by a degree of rand weakness, which is very likely in such circumstances. Rand strength that accompanies global economic strength with higher metal prices is unlikely to offset the favourable influence of higher metal prices in USD on the rand values of Resource companies listed on the JSE. The same global influence will be relevant for JSE listed industrial companies when most of their activities conducted outside of the SA economy. When the source of rand weakness however is specific to events in SA, the unaffected USD and hence still higher

rand values of these industrial and mining companies will act as a useful hedge against a weaker rand. They are perhaps better described as SA economy than rand hedges.

The history of the relationship between the rand and the JSE with the EM Indexes- mean reverting- to a one to one ratio

In the figure below we track the ratios between the daily values of the JSE and the EM Index and the ratio of the USD/ZAR to the EM currency basket. As may be expected, given the highly correlated movements reported above, these ratios tend to revert to a long-term ratio of one. Further statistical tests on the models of the USD/ZAR and the JSE to be reported upon will demonstrate this mean reversion. This reversion to an average ratio of one appears more obvious in the case of the relationship between the USD value of the ZAR and the EM currency basket. Higher ratios indicate relative rand weakness.

The USD/ZAR exchange rate was relatively very weak when compared to EM currencies between 2001 and 2002. It was weak again in 2008 during the Global Financial Crisis and was also relatively weak compared to other EM exchange rates when the lockdowns were introduced in 2020.

The USD/ZAR appears to be particularly exposed to the severe cases of global stress. It might therefore be described as a high beta EM currency. The rand weakened against other EM exchange rates for most of the period 2012-2016 though it recovered relatively to the other EM exchange rates in 2014, even as both the USD/ZAR and the EM/USD weakened sharply between 2014 and 2016. Yet such periods of relative to other EM exchange rates rand weakness have been followed by extended periods of relative rand strength- as for example after 2003 or 2009. And again in 2021 when the rand recovered lost ground against the USD and relative to other EM exchange rates after its weakness after the initial lockdowns of Q2 2020. The tendency of the ratio of exchange rates (ZAR/EM) to revert over time to square one with other EM exchange rates seems clear enough.

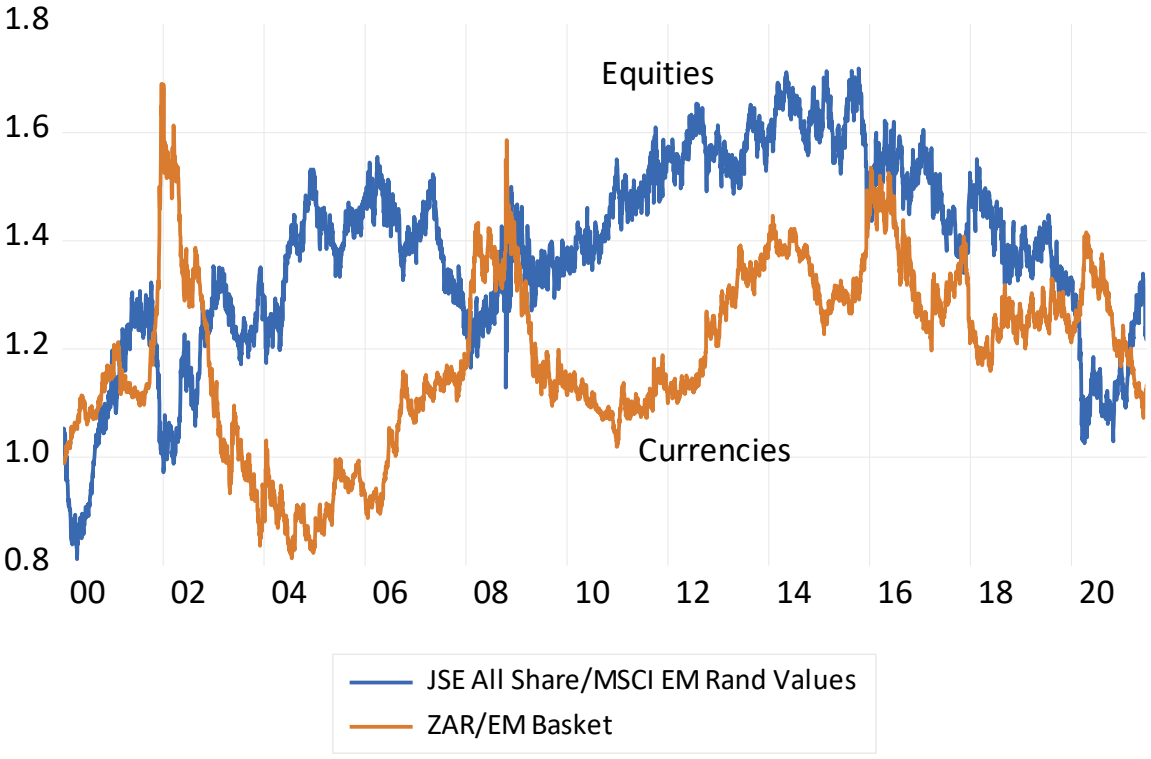
The ratio between the value of the JSE and the EM equity index in a common currency, in this case the USD/ZAR the reversion to a mean appears to take much longer. The JSE outperformed the EM Index consistently between 2006 and 2014, then underperformed for most of the period between 2015 and early 2020 after which it again outperformed the EM Index.

The dominant force on all EM exchange rates, including the ZAR, is the exchange value of the USD with the currencies of the developed world, its peers the Euro, Yen, Pound Sterling and the Swiss Franc, as represented by the DXY Index which is a trade weighted average of these developed market exchange rates with the USD, with the Euro accorded a weight of over 50% in the DXY. The higher the value of the DXY the stronger the USD. The daily correlation between the DXY and both the USD/ZAR and the USD/EM basket since 2000 is very high. (The higher the rand value attached to the USD (USD/ZAR) the weaker the rand) The simple correlation statistic

between the DXY and USD/ZAR is (R=0.77) with the USD/ZAR, and even higher (R=0.87) with the EM basket.

These correlations are not as high as the correlation between the ZAR and EM exchange rates which is an even higher (R=0.97) as mentioned previously. Hence we have used the exchange value of the EM basket with the USD rather than the DXY to explain the behaviour of the USD/ZAR. Yet it should be appreciated that it is the strength or weakness of the dollar with its own peers and the similar impact it has on the USD/ZAR and USD/EM exchange rates, that connects the ZAR so strongly with other EM currencies. We will report below on a similar model of the exchange value of the EM basket with the USD, with the DXY identified as the dominant explanatory variable of these EM currencies.

Fig.4; South African values equities and exchange rates compared to EM. Ratio SA/EM; 2000=1



Seeking a margin of safety through analysis. The philosophy.

It is more than of academic interest to observe and identify the importance of the EM influence on the JSE and the ZAR. If a constructive explanation of what has happened to the markets before

is available, it may also be valuable to regard periods when the rand and the JSE has moved ahead or behind its EM peers, as something of a leading indicator for the future direction of the markets. If the ZAR/USD or the JSE appears significantly over or undervalued according to past behaviour it could be regarded as a warning signal to investors to reduce or add exposure to the ZAR or the JSE. Market determined prices market will surely continue to move randomly in response to the forces that move the markets, but the chances of an upward or downward drift in the daily movements may be improved by selecting a safer starting point for entering or exiting the market. That is an entry or exit point for investors that can be regarded with good reason as offering some margin of safety. Market timing decisions have little else to rely upon.

Estimating the consistent relationships- broadening the model of the USD/ZAR

A single linear regression estimate of the log value of the USD/ZAR, using the rand value of the EM index as the only independent variable, can explain 89% of its daily value since 2005. We start in 2005 because some of the other time-series data we will examine for their influence on the USD/ZAR and the JSE do not go back further than 2005. In this one variable model the EM exchange rate co-efficient, its beta, is 1.20, that is every one per cent move in the EM currency will move the USD/ZAR by more than the average EM exchange rates, all else remaining unchanged. The fit of the one variable equation is also very good, with an adjusted R squared of 0.89 (The USD/ZAR appears on the 30th June to be about 15% overvalued when only other EM exchange rates are applied to explain the dollar value of the rand.

Clearly there are other forces that influence the performance of the USD/ZAR and the JSE than other EM exchange rates Vs the USD or the EM equity benchmark Vs the JSE. They need to be identified to improve the sense of danger or opportunity in the current state of the market which we attempt to do. Though it should be recognised that the values attached to EM equities and EM exchange rates provide by far the largest part of the explanation of why the market in the ZAR and JSE equities is what it is, on any one day.

Adding additional explanatory variables with plausible theoretical justification to the models has improved the fit of the models. The additional variables confirm the stationarity of the models. That is help confirm that when the model predictions temporarily veer away from the market, the market valuations are likely to return to their predicted values. The residual of these models with additional explanatory variables – the difference between actual and predicted values -can be shown to be mean reverting. This is a very helpful condition to reinforce the validity of the models and to justify their application.

The role of the US dollar as represented by the DXY- in explaining the emerging market exchange rates with the USD

One candidate for inclusion in the model of the USD/ZAR is the strength of the dollar relative to the currencies of the developed world, the Euro, the Yen, the pound and the Swiss franc, as

captured by the DXY index. The dollar Vs its peers could be predicted to have a similar influence on all other exchange rates, including emerging market exchange rates, which is indeed the case. The value of the EM basket and the ZAR Vs the USD declines and improves consistently with USD strength and weakness. For the model builder these high correlations would make it an incorrect statistical procedure to include both the EM Basket exchange rates and the DXY as independent variables to explain the USD/ZAR. They are clearly not independent and to regard both as explanatory variables would be equivalent to using the same variable more than once in an equation.

Clearly the influence of the dollar on the USD/ZAR, as represented by the DXY, is largely captured by the EM currency basket. Therefore given the strong interdependence of the DXY and the EM basket Vs the USD, only that part of the EM exchange rates not explained by the DXY could be regarded as an independent influence on the USD/ZAR exchange rate in a regression equation. This independence can be established by regression analysis. The residual of an equation that explains the EM with the DXY could be added to the explanation of the ZAR/USD. This is a statistical process known as orthogonalizing the independent variables that will be applied further in developing the models of the ZAR and the JSE.

Measuring SA specific risks and their influence

The exchange value of the rand is also influenced by economic and political developments specific to South Africa. The greater the SA risks the less valuable will be the ZAR and the JSE, again other things holding the same, which they may not. There are measures of SA specific risks and their influence on the value of the ZAR and the JSE that can be tested for inclusion in the models of the ZAR and the JSE. For example, the cost of insuring SA dollar denominated debt issued by the RSA against default is an independent measure of SA sovereign risk that can help explain the value of the USD/ZAR. This insurance is known as a CDS (Collaterised Debt Security) and is offered on 5-year RSA dollar denominated debt. This risk spread, the difference between the yield on a CDS and a US Treasury Bond of the same duration, is approximately equivalent to the difference in the yield offered by an RSA five-year obligation (a so-called Yankee Bond) and the lower yield on a US Treasury Bond with the same maturity. The more SA risk recognised the weaker the USD/ZAR exchange rate.

The role of exchange rate risk

Another measure of risk, of exchange rate risk, is the difference in yield provided by an RSA bond issued in rands and a US Treasury Bond of the same maturity. This difference in yields indicates the rate at which the ZAR is expected to depreciate against the US dollar. This spread is reflected in the forward exchange rates attached to USD for delivery against rands in the future. The rand cost of a dollar delivered in the future- say in a year - will be the spot price of a dollar plus the difference in interest rates over the period. The yield spread ensures that the benefits of lending or borrowing in the two currencies, when fully hedged against exchange rate movements will be the same. It is an equilibrium condition known as interest parity that is maintained by arbitrage

in the bond and currency markets. The evidence is that the wider the spread, the weaker will be the spot rate of exchange.

This spread is sometimes described as the interest carry. The carry is positively correlated with the spot value of the rand. That is the weaker the rand the greater the carry. As if rand weakness is associated with more rand weakness to come rather than as movement to equilibrium. This connection does not appear to hold for the relationship between spot and forward exchange rates in the developed currency markets.

These two measures of SA risk however are also highly correlated. The correlation between the SA sovereign risk spread and the five-year interest carry is (R=0.77) while both measures of SA risk are also correlated with the EM exchange rate basket. The correlation is (R=0.41) between the SA carry and the exchange value of the EM basket and (R=0.53) between SA sovereign risk and the EM basket. Also considered was the influence of commodity prices in USD on the exchange value of the ZAR.

The correlation between the Bloomberg Commodity Price Index and the USD/ZAR is a very high and negative -higher prices add rand strength - (R=-0.94) As elevated is the negative correlation between the EM exchange rate basket and commodity prices (R=-0.96) It would be inadmissible to include both the highly correlated EM currency basket and the Commodity Price Index to explain the exchange value of the ZAR. The rand can be described equivalently as an EM currency or as a Commodity currency, because EM currencies, including the rand respond, so directly to the similar forces that determine commodity prices.

Included in our model of the USD/ZAR is that small part of the commodity price index not explained by the EM currency basket. We examined the links between the DXT and the USD/ZAR as a further explanatory variable However the correlation between the EM exchange rates and the DXY is R=0.87. The stronger the dollar, the higher the DXY index, the higher the EM and ZAR cost of a dollar. The small part of the DXY not captured by the EM exchange rates proved to have a statistically insignificant impact on the USD/ZAR and was excluded from the model.

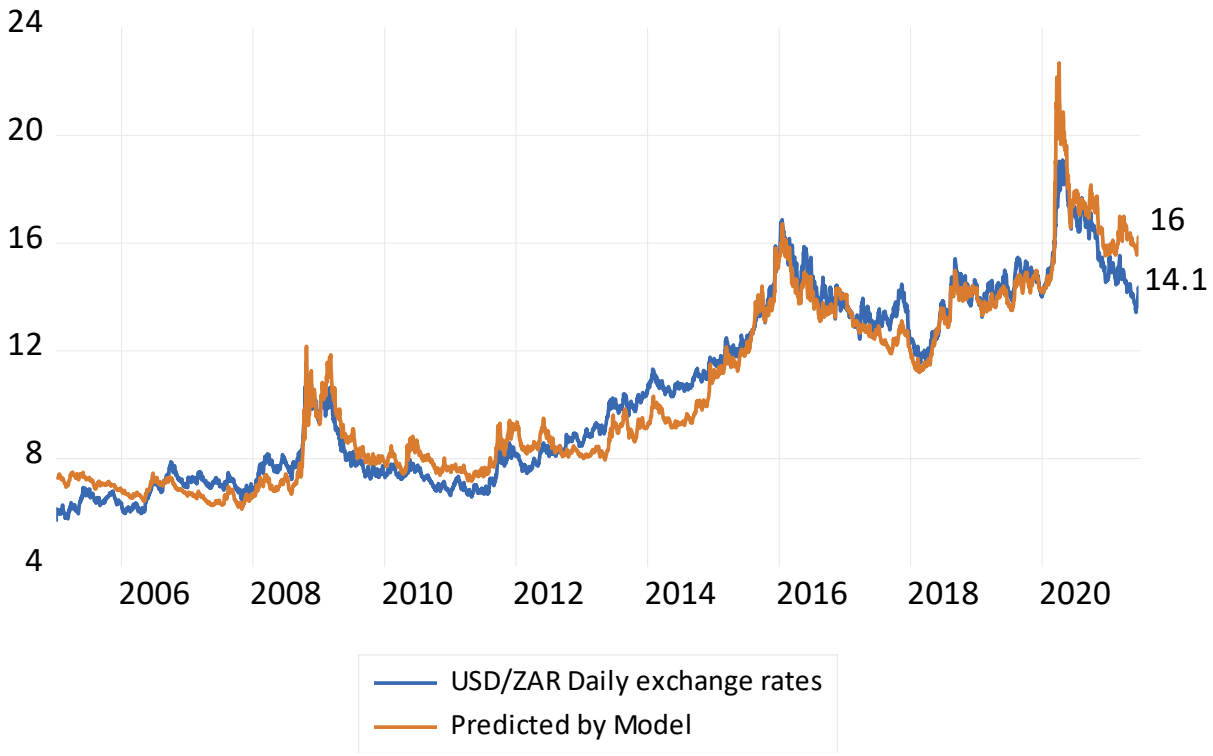
The fuller model we have applied to estimate the daily value of the USD/ZAR includes as explanatory variables, the log of the USD/EM exchange rates, described as (EMNEW) in the regression equations reported. The additional variables included in the regression model are the interest carry, net of the Sovereign Risks (SASOVEMNEWRES) The five-year yield spread between RSA rand bonds and five year US Treasury Bonds, was also estimated net of the EM effect with which it was correlated. However this residual and the sovereign risk residual were also highly correlated ruling out the inclusion of both in the model. Therefore we included the influence of the carry, net of the sovereign risk measure in the model.

The fit of the model is a very good one. (Adjusted R squared =0.94) The R squared for a model of the USD/ZAR with the EM basket as the only independent variable as mentioned earlier was 0.89. The EM exchange rate beta for the broader model remains a very similar 1.2 and is highly significant, as are the other explanatory variables. The interest carry beta is 0.04 and the

sovereign risk beta 0.09. That is every one-percentage move in the carry has weakened the ZAR by 4% and a one percentage move in the sovereign risk premium has weakened the USD/ZAR by 9%- for any given level of the EM currency basket.

The model indicates that the USD/ZAR was 11% overvalued on the 30th June 2021. The predicted value on the 30th June 2021 was R16 and the market value R14.01. The equation and the test for stationarity of the residual of the equation are reported in the Appendix. The residual of the model is stationary, that is movements away from predicted values are mean reverting.

The USD/ZAR and its predicted value. Daily Data



The USD/ZAR exchange rate model

Tables for the Statistical Appendix

Dependent Variable: LOG(ZARNEW)

Method: Least Squares

Date: 07/18/21 Time: 08:45

Sample (adjusted): 1/11/2005 6/30/2021

Included observations: 4297 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.683040	0.011696	-58.40066	0.0000
LOG(EMNEW)	1.201749	0.004695	255.9865	0.0000
SASOVEMNEWRES	0.093561	0.001589	58.87051	0.0000
YGAPSASOVRES	0.038552	0.001598	24.12345	0.0000

R-squared	0.941792	Mean dependent var	2.295801
Adjusted R-squared	0.941751	S.D. dependent var	0.320024
S.E. of regression	0.077237	Akaike info criterion	-2.282949
Sum squared resid	25.61004	Schwarz criterion	-2.277024
Log likelihood	4908.916	Hannan-Quinn criter.	-2.280856
F-statistic	23153.29	Durbin-Watson stat	0.012644
Prob(F-statistic)	0.000000		

Null Hypothesis: ZARRES has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.613406	0.0056
Test critical values:	1% level	-3.431689	
	5% level	-2.862017	
	10% level	-2.567067	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ZARRES)

Method: Least Squares

Date: 07/18/21 Time: 09:02

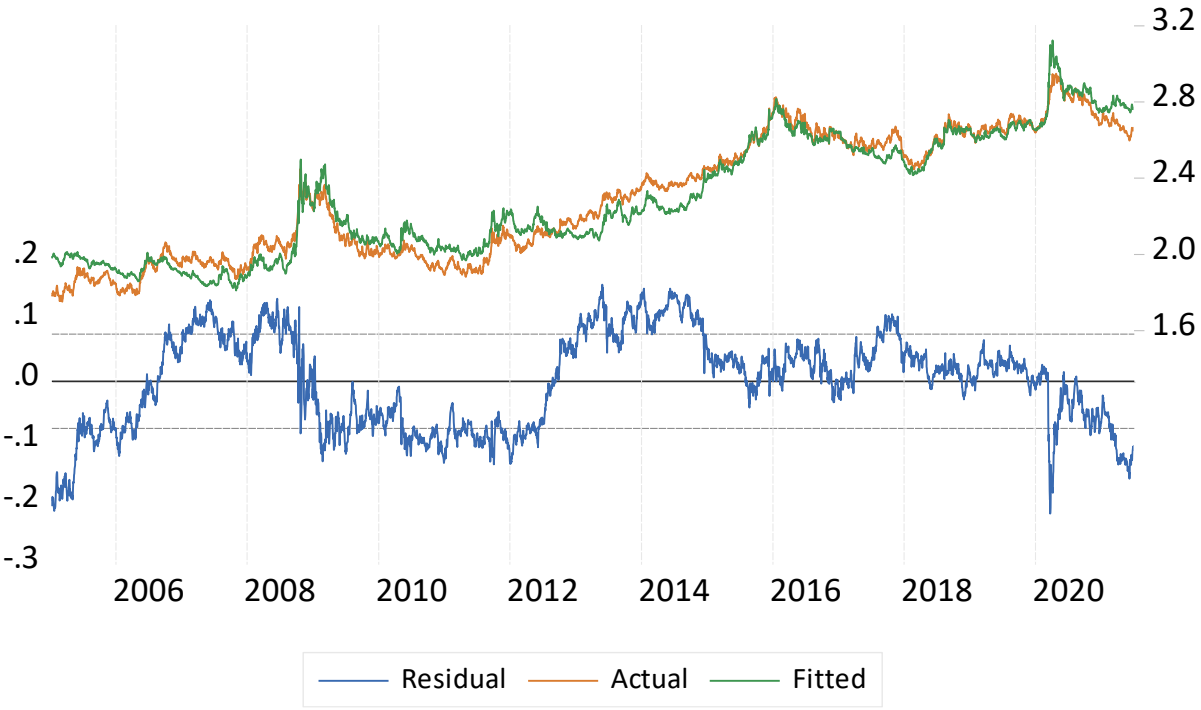
Sample (adjusted): 1/14/2005 6/30/2021

Included observations: 4294 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ZARRES(-1)	-0.006200	0.001716	-3.613406	0.0003
D(ZARRES(-1))	-0.054855	0.015240	-3.599464	0.0003
D(ZARRES(-2))	-0.055156	0.015234	-3.620498	0.0003
C	2.10E-05	0.000132	0.158813	0.8738

R-squared	0.009335	Mean dependent var	1.78E-05
Adjusted R-squared	0.008642	S.D. dependent var	0.008683
S.E. of regression	0.008646	Akaike info criterion	-6.662562
Sum squared resid	0.320675	Schwarz criterion	-6.656633
Log likelihood	14308.52	Hannan-Quinn criter.	-6.660468
F-statistic	13.47500	Durbin-Watson stat	1.999958
Prob(F-statistic)	0.000000		

The actual and estimated log value of the USD/ZAR



A correlation table for the independent variables of the model of the USD/ZAR

	LOG(ZARNEW)	LOG(EMNEW)	SASOVEMNEWRES	YGAPSASOVRES
LOG(ZARNEW)	1.000000	0.941654	0.216111	0.082306
LOG(EMNEW)	0.941654	1.000000	-0.001192	-0.008106
SASOVEMNEWRES	0.216111	-0.001192	1.000000	0.005143
YGAPSASOVRES	0.082306	-0.008106	0.005143	1.000000

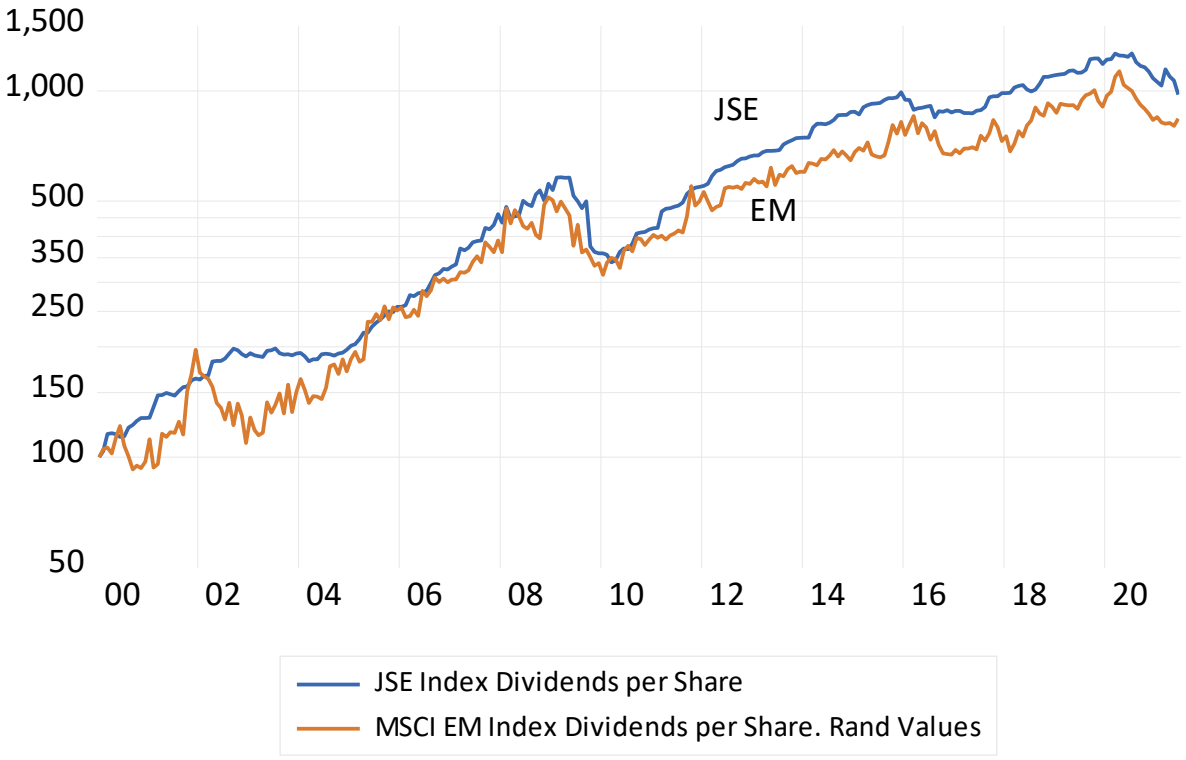
A model of the JSE All Share Index.

We adopt a similar procedure to explain the daily value of the JSE All Share Index. The correlation between the rand value of the JSE and the EM equity benchmark since 2005 is very close to one (R= 0.98) The reason for such a close connection is to be found in the highly similar trends in the earnings and dividends generated by the two Indexes that can be expected to strongly influence the value of the two Indexes. The correlation between the earnings and dividends reported by the JSE and by the MSCI EM Index is extraordinarily high. The correlation between the log of the JSE Index dividends per share and the log of MSCI EM dividends per share in rands is almost one to one (R=0.96) using month end data. The correlation between Index earnings is very similarly as high. This must be regarded as a co-incidence of the composition of the underlying Indexes. This remarkable and consistently strong relationship connects in a very fundamental way the two Indexes. It also means that including both the value of the EM equity benchmark and the flow of dividends from JSE listed companies would be inadmissible. The statistically very similar flow of dividends explains both the value of the JSE and the MSCI EM.

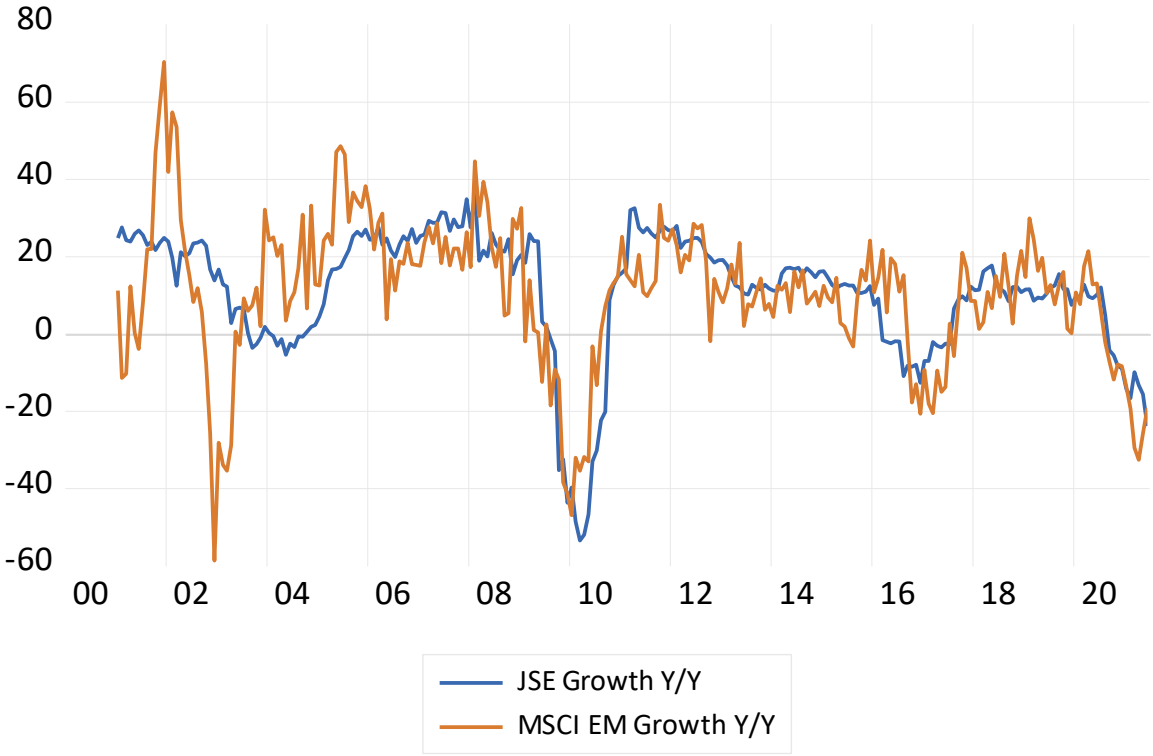
The role of Index earnings and dividends per share on Index Values. The earnings and dividend fundamentals

Any regression equation attempting to estimate the value of the JSE all share index should not include both the EM Index (EMZAR) and JSE dividends or earnings per share as explanatory variables, given their statistical equivalence. In the model estimated we include the EM benchmark as an explanatory variable and only the JSE dividends not captured by the EM Equity Index as a further explanatory variable.

Fig. Index Dividends Per Share Log Values in Rands 2000=100 Monthly Data



JSE and MSCI EM Annual Growth in Dividends per Index Share. Monthly Data. Rand Values



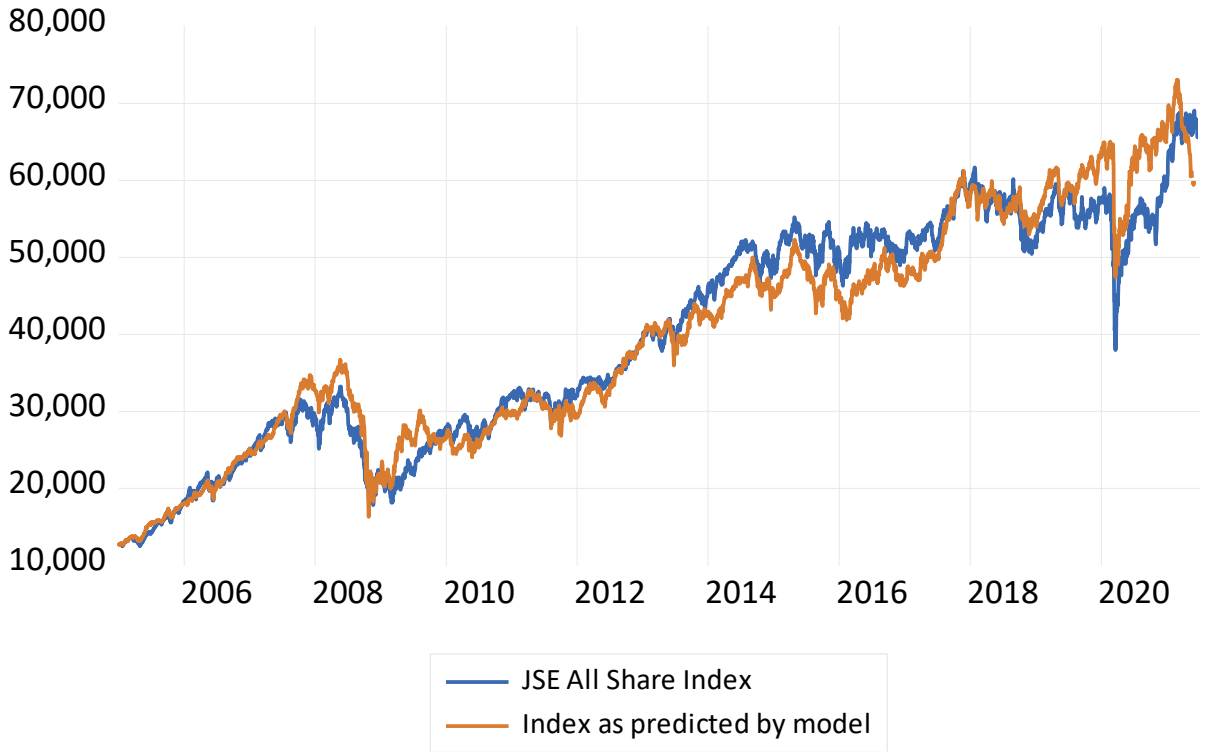
We adopt a similar approach to the other variables that theory suggests will influence the value of the JSE, but which turn out to be also significantly correlated with the EM Equity Index. The developed equity market Index, the benchmark S&P 500, is one such candidate. The correlation between the rand value of the S&P500 and the JSE is a high (R=0.90) However the correlation between the S&P 500 and the MSCI EM is equally high. Hence we ran the model include in the model only that part of the S&P not captured by the EM Index. The S&P effect so adjusted turned out to be still highly correlated ted with the EM equity index and so it was excluded from the model on grounds of co-linearity. Similarly the residual of SA sovereign risk with the EM Index

measure highly correlated with the JSE and the EM Index also turned out to be highly correlated with the EM Index and so it too was excluded from the model as was the residual of the JSE cover ratio with the EM Index for the same reasons.

The model estimated included as explanatory variables the EM Index in ZAR, the JSE dividends per share not explained by the EM Index, (DIVALEMZARRES) Commodity Prices not captured by the EM Index (BLOOMEMZARRES) We added a further variable , Long term interest rates in SA, again net of their relationship with the EM Index with a negative influence on the JSE

The model has a very good fit. (R squared =0.96) improved on the fit when only the EM Index is applied as the only independent variable. All the other variables are statistically highly significant. The EM Equity Index beta is nearly one (0.95), the dividend beta net of the EM influence on the JSE, has a value of 0.15. The commodity price beta is 0.09 SA interest rates (net of their connection to the EM Index) also has had a predictably negative influence on the JSE (-0.08) All the estimates of the co-efficients of the model are highly significant.

The JSE All Share Index and as predicted by the Model.



The model at the end of June 2021 indicated a very fairly valued JSE at June 2021 month end. The outperformance of the JSE, compared to the MSCI EM from October 2020 took the JSE from a highly undervalued state in mid-2020, to its overvalued appearance at June month end. Applying

the same model in mid or even late 2020 would have provided a very clear signal of the relative attractions of the JSE. The test of any model is to establish by way of a back test how it would have performed at identified episodes in the past. That is how helpful would the model have been, knowing only what the model builder could have been known at that time. That is to apply an out of sample rather than an in-sample test to establish whether indeed there was some margin of safety to enter the market at a point in time that hindsight tells us it would have been.

The full statistical results are reported in the Appendix as is the favourable test of the model for its stationarity or mean reversion. Movements away from the fair value as indicated by the model can be expected to be reversed in time. Though the time to be taken my well vary. The models indicate margins of safety – they should not be regarded as market timing models.

The model of the JSE. Statistical Appendix

Dependent Variable: LOG(ALSI)
Method: Least Squares
Date: 07/19/21 Time: 11:42
Sample (adjusted): 1/03/2005 6/01/2021
Included observations: 4281 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.783519	0.024465	72.90159	0.0000
LOG(EMZAR)	0.954857	0.002674	357.1255	0.0000
DIVALEMZARRES	0.148864	0.006625	22.46888	0.0000
BLOOMEMZARRES	0.093547	0.010355	9.034288	0.0000
SAGB10EMZARRES	-0.080048	0.001735	-46.13407	0.0000

R-squared	0.968339	Mean dependent var	10.51117
Adjusted R-squared	0.968309	S.D. dependent var	0.416984
S.E. of regression	0.074231	Akaike info criterion	-2.362103
Sum squared resid	23.56178	Schwarz criterion	-2.354673
Log likelihood	5061.082	Hannan-Quinn criter.	-2.359478
F-statistic	32694.86	Durbin-Watson stat	0.024905
Prob(F-statistic)	0.000000		

Null Hypothesis: ALSIRES has a unit root
Exogenous: Constant
Lag Length: 6 (Automatic - based on SIC, maxlag=30)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-3.244066	0.0177
Test critical values:	1% level	-3.431696	
	5% level	-2.862020	
	10% level	-2.567068	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(ALSIRES)

Method: Least Squares

Date: 07/19/21 Time: 11:45

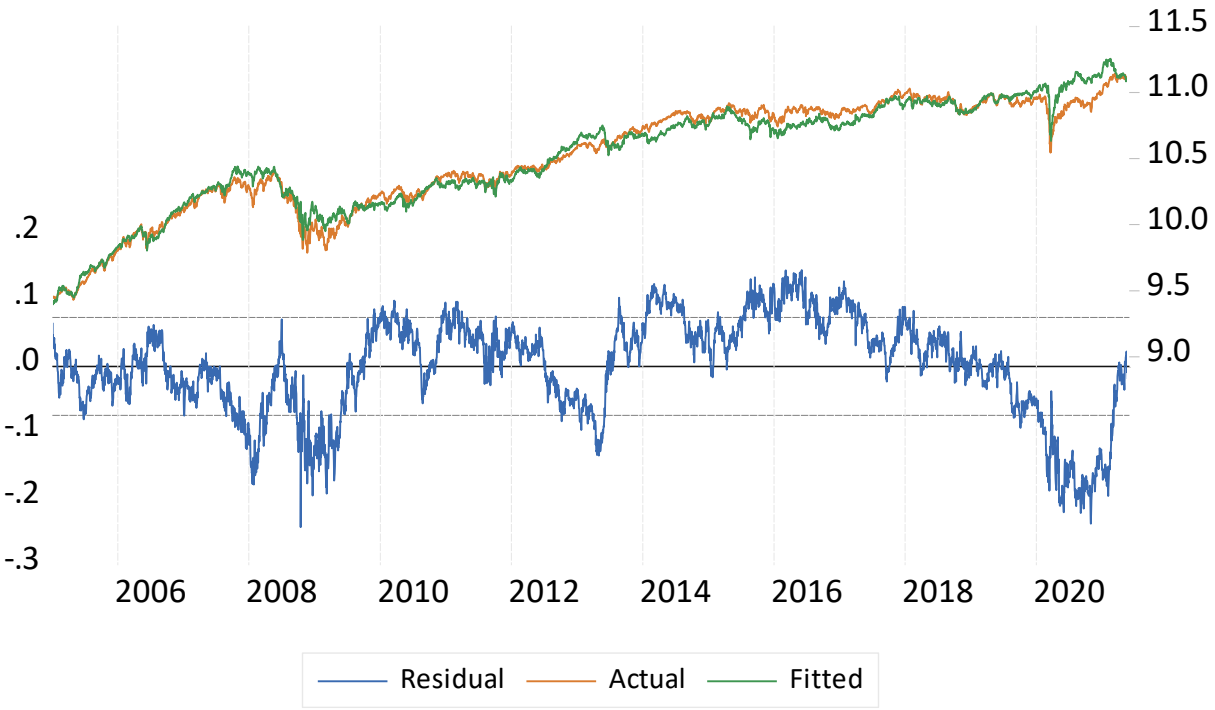
Sample (adjusted): 1/03/2005 5/21/2021

Included observations: 4275 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ALSIRES(-1)	-0.007697	0.002373	-3.244066	0.0012
D(ALSIRES(-1))	-0.221570	0.015348	-14.43601	0.0000
D(ALSIRES(-2))	-0.079874	0.015667	-5.098175	0.0000
D(ALSIRES(-3))	-0.072547	0.015699	-4.621062	0.0000
D(ALSIRES(-4))	-0.047618	0.015692	-3.034464	0.0024
D(ALSIRES(-5))	-0.075452	0.015652	-4.820518	0.0000
D(ALSIRES(-6))	-0.051459	0.015297	-3.364116	0.0008
C	-1.22E-05	0.000174	-0.070304	0.9440

R-squared	0.058541	Mean dependent var	-8.99E-06
Adjusted R-squared	0.056996	S.D. dependent var	0.011724
S.E. of regression	0.011385	Akaike info criterion	-6.111234
Sum squared resid	0.553046	Schwarz criterion	-6.099331
Log likelihood	13070.76	Hannan-Quinn criter.	-6.107029
F-statistic	37.90364	Durbin-Watson stat	1.997788
Prob(F-statistic)	0.000000		

The model of the Log of the JSE. Actual and estimated by the model values



Correlation of the explanatory variables of the JSE Model

	LOG(ALSI)	LOG(EMZAR)	DIVALEMZARRES	BLOOMEMZARRES	SAGB10EMZARRES
LOG(ALSI)	1.000000	0.972037	0.084147	0.023856	-0.140691
LOG(EMZAR)	0.972037	1.000000	0.000596	-0.003197	-0.002336
DIVALEMZARRES	0.084147	0.000596	1.000000	-0.003025	-0.169552
BLOOMEMZARRES	0.023856	-0.003197	-0.003025	1.000000	-0.020111
SAGB10EMZARRES	-0.140691	-0.002336	-0.169552	-0.020111	1.000000

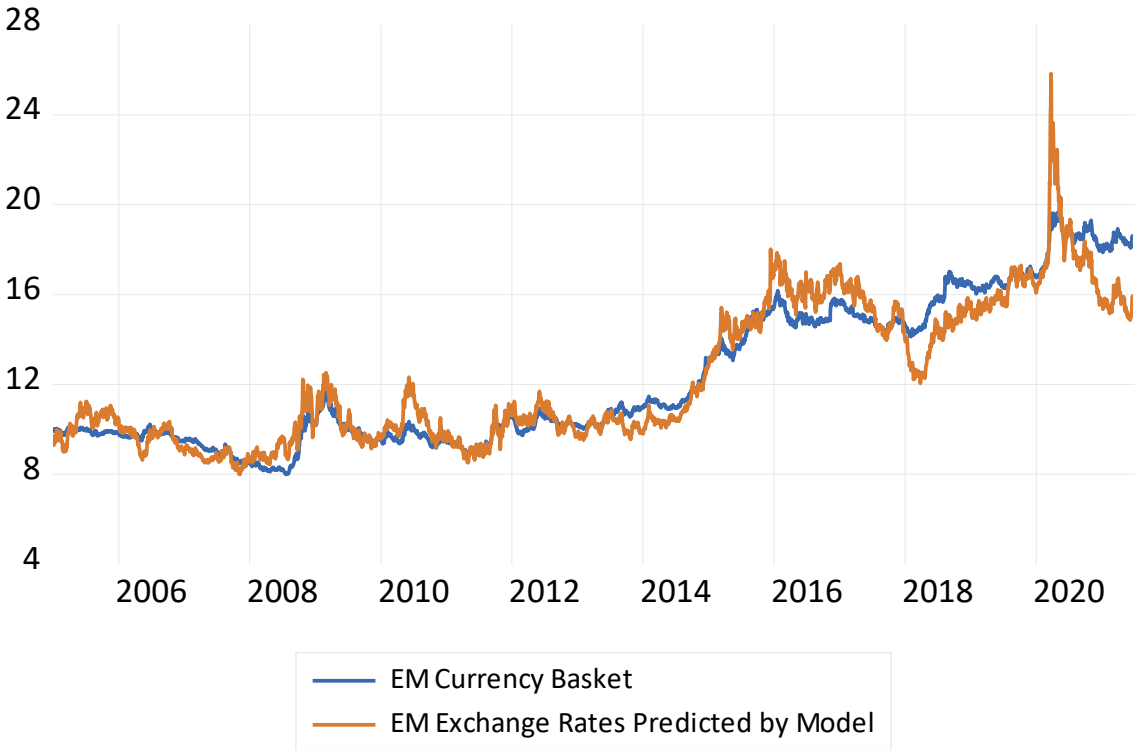
Extending the analysis to explain the EM currency and equity Indexes and the S&P 500

Explaining the EM exchange rates.

The USD dollar value of the EM currency basket is very well explained by the (DXY)and the interest carry on EM exchange rates, net of the DXY influence on them. (YGAP10DXYRES) We use the RSA 10 year carry as representative of the expected direction of EM exchange rates. (USD/EM) Both variables are highly significant. The DXY beta is 2.35 and the interest rate beta is 0.84. The model

fit is very good (R squared=0.92) and the residual of the model is mean reverting at a high almost 1% confidence limit

The market value of the EM exchange rate basket and its value as estimated by the model.



The EM exchange rates appear as distinctly undervalued- in contrast to the USD/ZAR which appears as overvalued. If we were to replace the actual EM basket with its value as forecast by the model in our one variable EM basket model of the USD/ZAR, the USD/ZAR would then appear to be at fair value, rather than overvalued. It may be concluded that the undervaluation of the USD/EM adds some safety to the USD/ZAR.

Dependent Variable: LOG(EMNEW)
Method: Least Squares
Date: 07/19/21 Time: 11:09
Sample: 1/03/2005 6/30/2021
Included observations: 4303

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-8.017374	0.050744	-157.9968	0.0000
LOG(DXY)	2.352100	0.011369	206.8824	0.0000
YGAP10DXYRES	0.083711	0.000831	100.7632	0.0000

R-squared	0.924896	Mean dependent var	2.478409
Adjusted R-squared	0.924861	S.D. dependent var	0.250936

S.E. of regression	0.068785	Akaike info criterion	-2.514961
Sum squared resid	20.34501	Schwarz criterion	-2.510522
Log likelihood	5413.938	Hannan-Quinn criter.	-2.513393
F-statistic	26477.03	Durbin-Watson stat	0.018035
Prob(F-statistic)	0.000000		

Null Hypothesis: EMNEWRES has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.234660	0.0006
Test critical values:	1% level	-3.431686	
	5% level	-2.862016	
	10% level	-2.567066	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EMNEWRES)

Method: Least Squares

Date: 07/19/21 Time: 11:10

Sample (adjusted): 1/04/2005 6/30/2021

Included observations: 4302 after adjustments

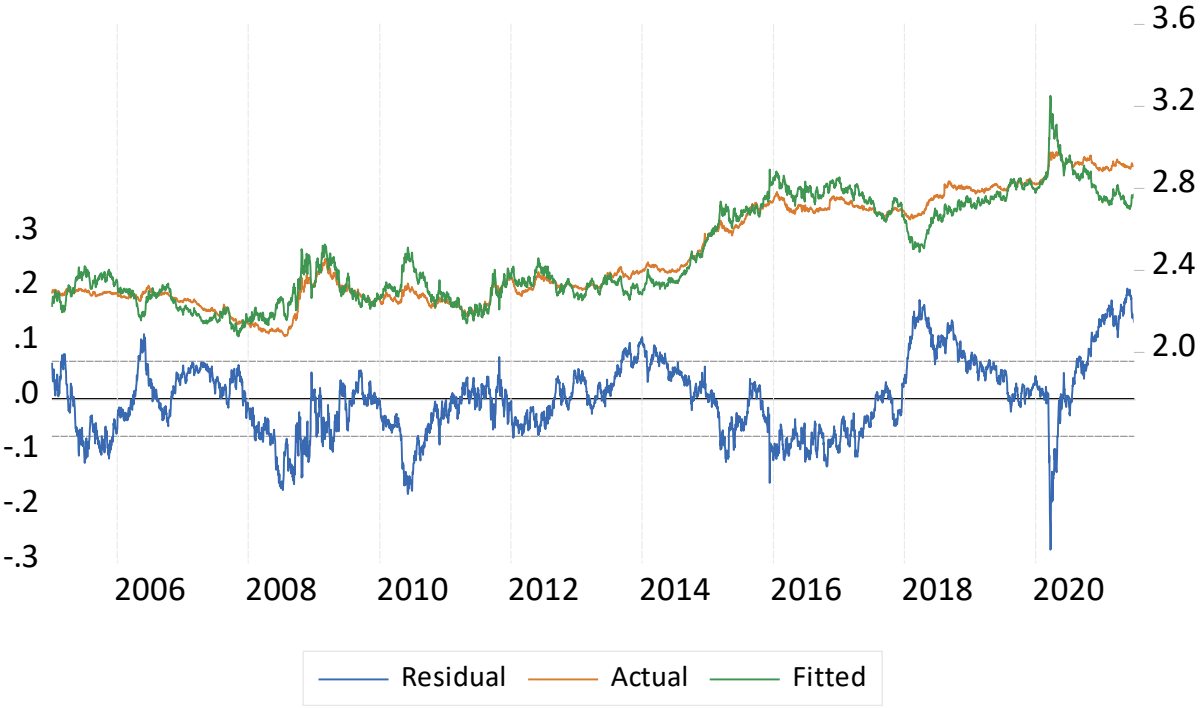
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EMNEWRES(-1)	-0.008659	0.002045	-4.234660	0.0000
C	1.67E-05	0.000141	0.118867	0.9054

R-squared	0.004153	Mean dependent var	1.70E-05
Adjusted R-squared	0.003921	S.D. dependent var	0.009236
S.E. of regression	0.009218	Akaike info criterion	-6.534774
Sum squared resid	0.365406	Schwarz criterion	-6.531814
Log likelihood	14058.30	Hannan-Quinn criter.	-6.533728
F-statistic	17.93234	Durbin-Watson stat	1.995056
Prob(F-statistic)	0.000023		

Correlation of the explanatory variables of the model

	LOG(EMNEW)	LOG(DXY)	YGAP10DXYRES
LOG(EMNEW)	1.000000	0.864615	0.421123
LOG(DXY)	0.864615	1.000000	1.17E-05
YGAP10DXYRES	0.421123	1.17E-05	1.000000

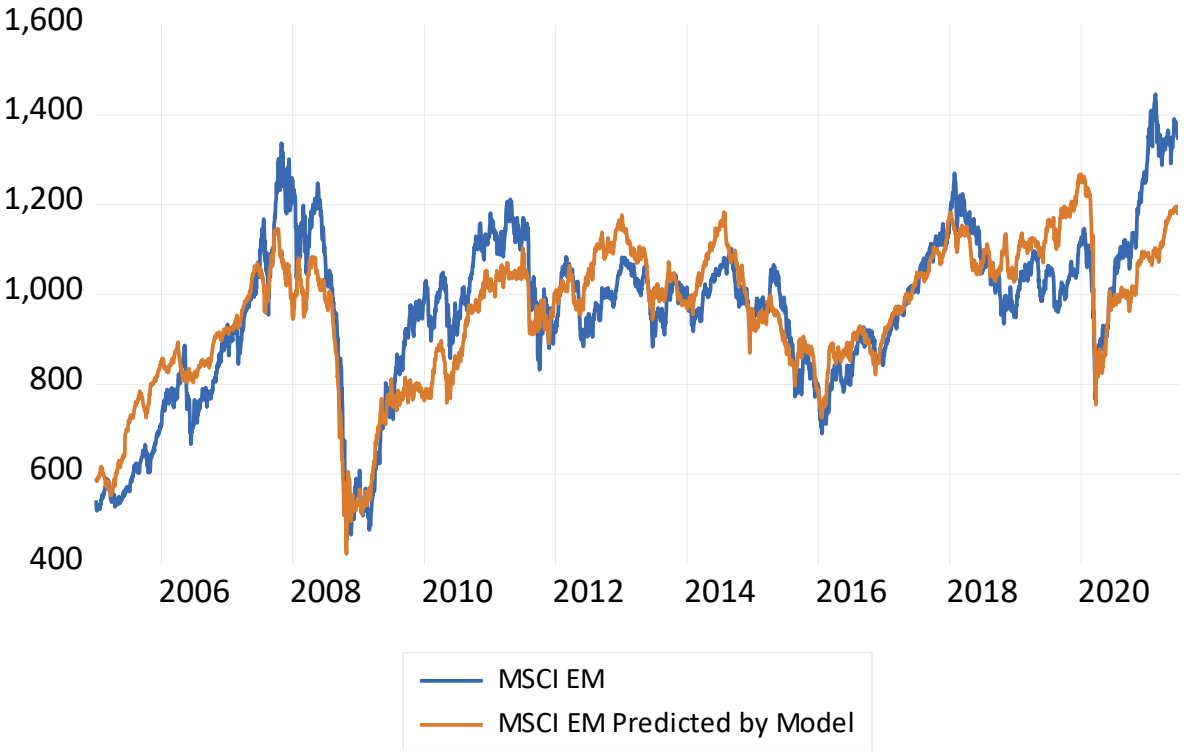
Log Value of the EM exchange rate – Market and estimated value



Explaining the MSCI EM Equity Index

The MSCI EM equity index in ZAR (EMZAR) is in well explained by EM Index dividends in ZAR (EMDIV*ZAR) and the rand value of the S&P 500 Index – not explained by the EM dividend flows- (SPZAREMDIVZARRES) with which the S&P is highly correlated R=0.80) We add an emerging market risk measure to the model, the CDS spread over US Treasuries of an Index of higher yielding EM debts (EMBP) We again measure EM risks as net of EM dividends with which they are also correlated. All the variables are statistically significant. The dividend beta is 0.91, the S&P effect net of the dividends is 0.16 and the risk measure beta is -0.10. The fit of the model is very good (R squared=0.95) The EM Index appears as 10% overvalued on June 30th 2021. The model passes the test for stationarity at the 1% confidence level. There would seem to have been little room for safety in the equity market valuations of June 2021.

The Actual and Predicted value of the EMCI EM. Converted to US Dollars



Model of the EM Index (ZAR Value)

Statistical Appendix

Dependent Variable: LOG(EMZAR)
Method: Least Squares
Date: 07/19/21 Time: 14:33
Sample: 1/03/2005 6/30/2021
Included observations: 4303

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.104860	0.035145	-2.983623	0.0029
LOG(EMDIV*ZAR)	0.916094	0.003478	263.4286	0.0000
SPZAREMDIVZARRES	0.160098	0.005614	28.51650	0.0000
EMBPEMDIVZARRES/100	-0.104830	0.001850	-56.64974	0.0000

R-squared	0.946592	Mean dependent var	9.144967
Adjusted R-squared	0.946555	S.D. dependent var	0.425907
S.E. of regression	0.098462	Akaike info criterion	-1.797367
Sum squared resid	41.67762	Schwarz criterion	-1.791448
Log likelihood	3871.036	Hannan-Quinn criter.	-1.795277
F-statistic	25398.37	Durbin-Watson stat	0.012310

Prob(F-statistic)	0.000000

Null Hypothesis: EMZARRES has a unit root

Exogenous: Constant

Lag Length: 9 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.777073	0.0001
Test critical values:	1% level	-3.431689	
	5% level	-2.862017	
	10% level	-2.567067	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EMZARRES)

Method: Least Squares

Date: 07/19/21 Time: 14:38

Sample (adjusted): 1/17/2005 6/30/2021

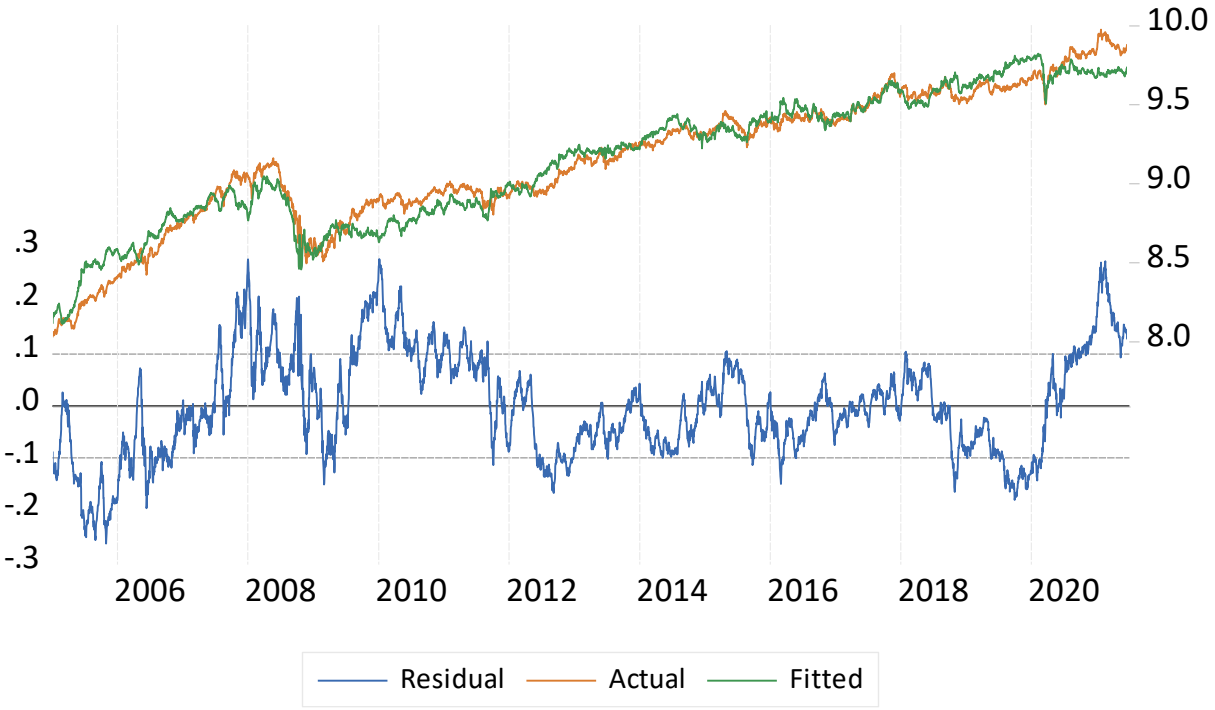
Included observations: 4293 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EMZARRES(-1)	-0.008149	0.001706	-4.777073	0.0000
D(EMZARRES(-1))	-0.035476	0.015241	-2.327704	0.0200
D(EMZARRES(-2))	0.026864	0.015229	1.763982	0.0778
D(EMZARRES(-3))	-0.006451	0.015181	-0.424916	0.6709
D(EMZARRES(-4))	0.031833	0.015181	2.096868	0.0361
D(EMZARRES(-5))	0.050047	0.015175	3.298093	0.0010
D(EMZARRES(-6))	0.013722	0.015189	0.903410	0.3664
D(EMZARRES(-7))	0.091577	0.015188	6.029508	0.0000
D(EMZARRES(-8))	0.060094	0.015253	3.939794	0.0001
D(EMZARRES(-9))	0.045113	0.015260	2.956205	0.0031
C	4.67E-05	0.000165	0.283119	0.7771

R-squared	0.022481	Mean dependent var	6.07E-05
Adjusted R-squared	0.020198	S.D. dependent var	0.010925
S.E. of regression	0.010814	Akaike info criterion	-6.213438
Sum squared resid	0.500725	Schwarz criterion	-6.197130
Log likelihood	13348.15	Hannan-Quinn criter.	-6.207678
F-statistic	9.847668	Durbin-Watson stat	1.997138
Prob(F-statistic)	0.000000		

	LOG(EMZAR)	LOG(EMDIV*ZAR)	SPZAREMDIVZARRES	EMBPEMDIVZARRES
LOG(EMZAR)	1.000000	0.928498	0.211223	-0.272730

LOG(EMDIV*ZAR)	0.928498	1.000000	-7.54E-11	-3.36E-14
SPZAREMDIVZARRES	0.211223	-7.54E-11	1.000000	-0.444317
EMBPEMDIVZARRES	-0.272730	-3.36E-14	-0.444317	1.000000



Understanding the S&P 500; A model of the S&P 500.

The most closely watched Equity Index is the S&P 500 which is a market weighted index of the 500 largest companies listed on the New York Stock Exchange. The S&P 500 gives strong direction to all the other equity markets.

The correlations of the daily closing values of the S&P500, the MSCI EM and the JSE All Share Index are statistically significant. The daily correlation of the level of the S&P 500 with the EM Index in USD since 2005 is (R=0.54) and the correlation of the S&P with the JSE in USD is (R=0.42). The correlation between the EM equity index and the JSE in USD is an elevated (R=0.89) These correlations are even higher when the Indexes are measured in ZAR. They are (R=0.92) between the daily rand values of the S&P and EM Indexes and (R=0.90) between the S&P and the JSE.

As previously reported, the correlation between the JSE and EM Indexes measured in ZAR is a very high (R=0.97) The correlations between daily percentage changes in the USD value of the Indexes are moreover impressively high. That is (R=0.48) between the S&P and EM and (R=0.57) between the S&P and JSE. The correlation of daily moves in the JSE and EM Indexes in USD is (R= 0.73) Converting the Indexes to their daily ZAR values reduces the correlation of daily movements. (R=0.19) for the S&P and JSE and (R=0.50) between the JSE and EM Indexes. Daily movements in the JSE in rands and dollars are not perfectly correlated (R=0.81) The correlation statistic is (R=0.97) between the level of the JSE in rands or USD. Clearly the connections between the various equity markets are very close.

Our models have attempted with success to incorporate the influence of the S&P on the EM Index and so in turn its influence on the JSE. The larger issue then becomes that of identifying the forces that move the S&P itself.

The model of the S&P 500

The dividend beta in a regression equation linking the S&P Index to S&P dividends per share is close to one and the co-efficient is highly significant. The t statistic has a very high value. The issue is to recognise the other consistent influences on the value of the S&P 500. The influence of interest rates on the value of the S&P is not unambiguous. The correlation statistics indicate that both the level of long-term interest and short-term rates appear are negatively related to the Index. Yet when they are included in a regression model of the S&P 500, with dividends as the other independent variable, the interest rate betas take on a positive value with statistical significance.

However long- term interest rates in the US, the 10 year Treasury Bond yield, is also highly correlated with the S&P 500 dividend flows. We therefore we include these long term rates not captured by dividend flows as an explanatory variable (GT10SPDIVRES) in the model of the S&P 500.

The negative influence of the dollar on the S&P, on the S&P is also included. The strength of the USD represented by the DXY, the dollar index Vs its peers, the Euro, Yen, Pound and Swiss Franc. A stronger dollar in response to movements of capital towards the US can indicate a higher degree of global risk aversion and the search for a safehaven that is not helpful for equities generally, including those that make up the S&P 500. A stronger USD may also be expected to reduce the dollar value of earnings generated abroad-hence the negative impact on the Index.

The dollar index, the DXY, and the dividend flows are highly correlated and so we include the DXY, not explained by the dividends as the explanatory variable. (DXYSPDIVRES) The further variable included is the ratio of earnings to dividends. We include that part of the earnings to dividends cover ratio, again not explained by the dividend flows, in a regression equation. (PAYOUTUSSPRES) The more cash retained – the higher the cover- the higher the S&P Index. As suggested this ratio may well be acting as a proxy for profit margins.

We include the S&P Volatility Index, the log value of the VIX to represent the risks to the S&P each day. The more the Index moves up and down daily to increase the Standard Deviation of the average daily movements in the S&P about its close to zero average, so goes the VIX, which measures the cost of insuring investors against market moves. The higher the value attached to the VIX the more risk investors are bearing and the weaker the market as was discussed earlier. During the early days of the lockdowns the VIX moved four times higher than its average of about 19 – to a level of 80 putting significant pressure on the S&P. The VIX reached similar levels with a similar impact on the market during the height of the GFC. The VIX has since receded and currently trades at close to its average value of 19.

The model estimated to June 2021 has an adjusted R squared of 0.94. The dividend beta is a plausible 1.09, the DXY has a negative influence on the S&P (beta= (-0.27), long term interest rates have an estimated positive beta (.03) as does the cover ratio (0.19) All the variables are statistically significant (generate high t statistics the coefficient divided by its standard deviation) The S&P appears significantly over valued on June 30th, 2021, by about 20%

Statistical Appendix for S&P Model (2005-2021)

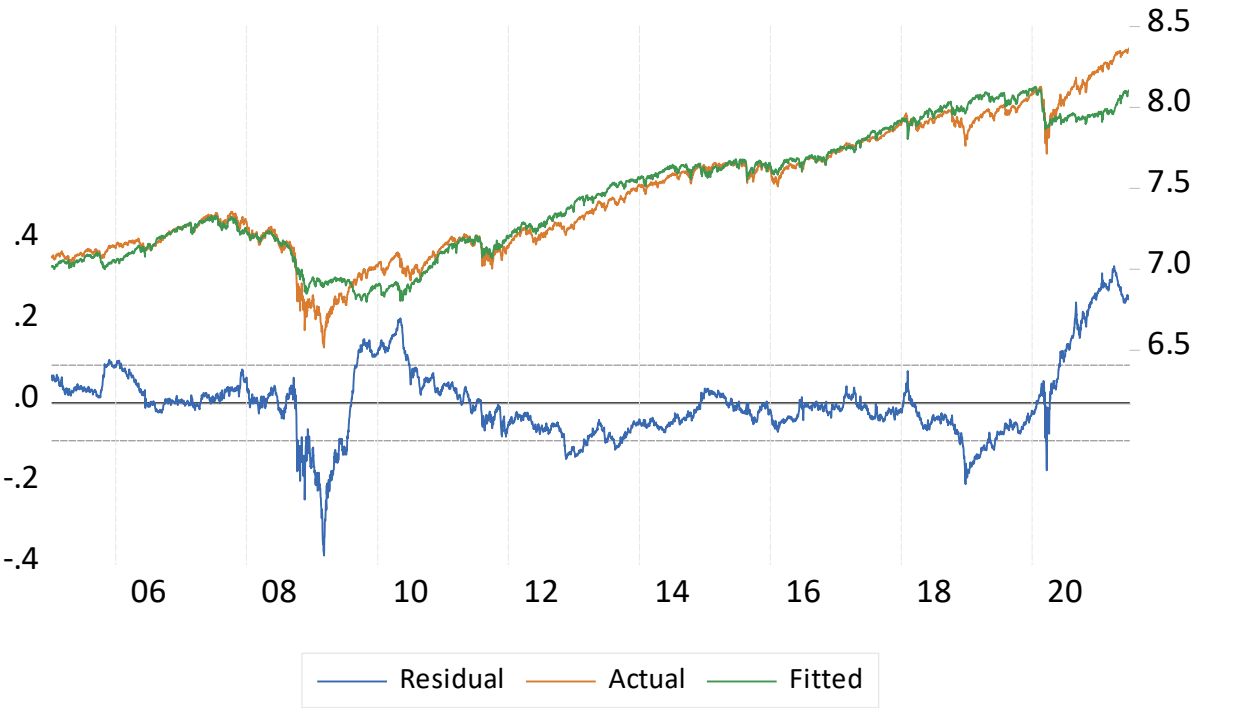
Dependent Variable: LOG(SP)
Method: Least Squares
Date: 07/16/21 Time: 11:06
Sample (adjusted): 1/10/2005 6/30/2021
Included observations: 4295 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-1.104464	0.038552	-28.64849	0.0000
LOG(SPDIV)	1.087105	0.004288	253.5394	0.0000
DXYSPDIVRES	-0.277030	0.024310	-11.39569	0.0000
LOG(VIX)	-0.109427	0.004371	-25.03583	0.0000
GT10SPDIVRES	0.033688	0.001961	17.17568	0.0000
PAYOUTUSSPDIVRES	0.192982	0.003998	48.26779	0.0000

R-squared	0.943730	Mean dependent var	7.459183
Adjusted R-squared	0.943664	S.D. dependent var	0.393451
S.E. of regression	0.093387	Akaike info criterion	-1.902744
Sum squared resid	37.40454	Schwarz criterion	-1.893852
Log likelihood	4092.142	Hannan-Quinn criter.	-1.899603
F-statistic	14386.45	Durbin-Watson stat	0.007350
Prob(F-statistic)	0.000000		

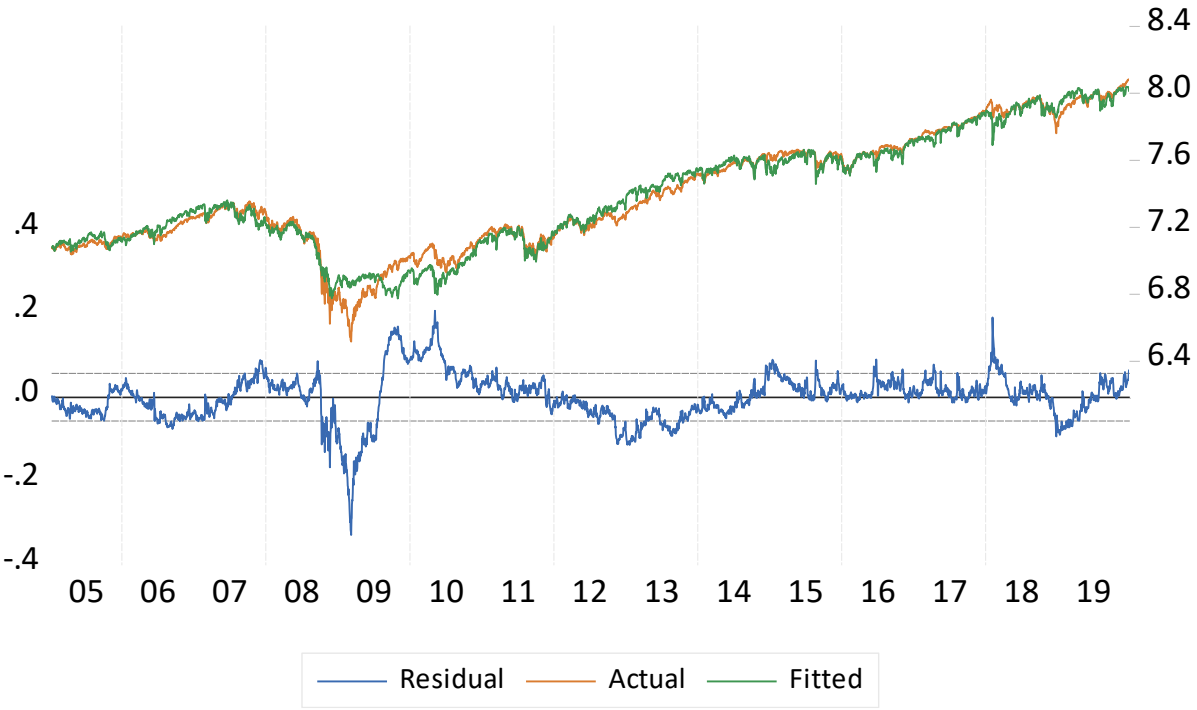
The log value of the S&P and its predicted (fitted) value



The model fails the test for mean reversion.

However the model estimated to June 2021 does not pass the test for stationarity (mean reverting) with a high level of confidence. However, when the same model is estimated to December 2019- before the crisis – the residual of the model proves to be stationary with a high level of confidence. The dividend beta falls back to 0.98, the influence of the USD is more muted (-0.14) the Vix beta is somewhat more negative in its influence (-0.16) and the influence of the cover ratio greater (0.47) The interest rate beta is a similar (0.04). All the variables are statistically significant and the fit is even better (Adjusted R squared=0.97) At December month end the market appeared to be close to its value predicted by the model – the S&P would then have appeared then to be about 5% overvalued.

The log value of the S&P 500 on December 31st 2019 and its predicted value.



Dependent Variable: LOG(SP)

Method: Least Squares

Date: 07/16/21 Time: 11:25

Sample (adjusted): 1/10/2005 12/31/2019

Included observations: 3907 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.068019	0.029528	-2.303523	0.0213
LOG(SPDIV)	0.976419	0.003161	308.8874	0.0000
DXYSPDIVRES	-0.142040	0.015201	-9.344029	0.0000
LOG(VIX)	-0.163669	0.002999	-54.57474	0.0000
GT10SPDIVRES2019	0.041916	0.001211	34.60116	0.0000
PAYOUTUSSPDIV2019	0.473073	0.006577	71.92791	0.0000

R-squared	0.972196	Mean dependent var	7.390862
Adjusted R-squared	0.972161	S.D. dependent var	0.341475
S.E. of regression	0.056976	Akaike info criterion	-2.890854
Sum squared resid	12.66349	Schwarz criterion	-2.881224
Log likelihood	5653.283	Hannan-Quinn criter.	-2.887436
F-statistic	27280.74	Durbin-Watson stat	0.022900
Prob(F-statistic)	0.000000		

Null Hypothesis: SPRES2019 has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on SIC, maxlag=30)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.020466	0.0013
Test critical values:	1% level	-3.431840	
	5% level	-2.862083	
	10% level	-2.567103	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(SPRES2019)

Method: Least Squares

Date: 07/16/21 Time: 11:49

Sample (adjusted): 1/13/2005 12/31/2019

Included observations: 3904 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SPRES2019(-1)	-0.009715	0.002416	-4.020466	0.0001
D(SPRES2019(-1))	-0.088911	0.016001	-5.556466	0.0000
D(SPRES2019(-2))	-0.062002	0.015987	-3.878191	0.0001
C	1.77E-05	0.000137	0.129593	0.8969

R-squared	0.016276	Mean dependent var	1.56E-05
Adjusted R-squared	0.015520	S.D. dependent var	0.008619
S.E. of regression	0.008552	Akaike info criterion	-6.684396
Sum squared resid	0.285200	Schwarz criterion	-6.677972
Log likelihood	13051.94	Hannan-Quinn criter.	-6.682116
F-statistic	21.50938	Durbin-Watson stat	1.998101
Prob(F-statistic)	0.000000		

Correlation matrix of the explanatory variables

	LOG(SPDIV)	LOG(VIX)	DXYSPDIVRES2019	GT10SPDIVRES2019	PAYOUTUSSPDIV2019
LOG(SPDIV)	1.000000	-0.293310	0.000876	0.001091	-0.000638
LOG(VIX)	-0.293310	1.000000	-0.230956	-0.259159	-0.375763
DXYSPDIVRES2019	0.000876	-0.230956	1.000000	0.206549	-0.017043
GT10SPDIVRES2019	0.001091	-0.259159	0.206549	1.000000	-0.022425
PAYOUTUSSPDIV2019	-0.000638	-0.375763	-0.017043	-0.022425	1.000000

The influence of the lockdowns on some of the important explanatory variables

The reason for the move from under to overvalued is to be found in the significant difference between the dividends we include in the model and the earnings realised over the period. It will take a strong recovery in dividends, linked to the strong recovery in earnings under way, to bring the S&P back into what may be regarded as "fair value" according to the models that use dividends as the measure of company performance. Another force worth noting was the extreme behaviour of the Vix over the period of the lockdowns and the threat they posed for the economy - from 13.7 at the end of 2019- up to 83 in mid-March 2020 and then gyrating back to 16 by the end of June 2021. There clearly is no margin of safety in current S&P valuations. The uniqueness of the recent times does not encourage a reliance on immediate past performance.

Finding regular patterns during an economic crisis

The recognition provided by the models led to a conclusion that during a crisis relying on past performance over the long run may be less helpful than usual. It led me to look for the patterns in a crisis of which we have two recent examples. I identified some of the important patterns in the following article written in mid-July 2021 when SA was undergoing one of its own unique crises of violent protest.

Case Study 2; The value of the JSE and the USD/ZAR. The model estimated in annual growth rates