Monetary policy and long-run share price reversals on the Johannesburg Securities Exchange

Rollins NG Ayaya
Runxin Lin
Department of Business Finance
University of Witwatersrand, South Africa

Onesmus Ayaya
School of Accountancy
University of Limpopo, South Africa

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Monetary, portfolio, policy, price, share, reversal.

Abstract

Purpose: *The study expounds on the phenomenon of long-run reversal and monetary policy in the financial markets. The study used Johannesburg Securities Exchange (JSE) data to determine whether the monetary policy changes implemented by the South African Reserve Bank impact long-run reversals in the JSE.*

Context*: Long-run share value reversals have occurred in various regional financial markets in the US, Europe, Asia, and South Africa. Long-run share value reversals occur when firms with poor past performance rebound and produce superior returns compared to firms with good historical past performance. South Africa has a monetary policy of inflation targeting, leading to upward lending rate adjustments whenever consumer inflation threatens to exceed 6%.*

Methods: *The regressions of the Fama-French three factors model and Fama-MacBeth model were used to estimate the relationship between the excess return of different portfolio returns and the Fama-French three factors. Furthermore, we split our sample under expansive and restrictive monetary conditions. We ran the regression of the Fama-MacBeth model again to see whether the monetary conditions will influence the long-run share price reversal.*

Results: *The sample results over the near 15-year sample period showed that firms with poor past performance failed to outperform those with past solid performance. The gap is closed under restrictive monetary conditions that tighten the liquidity conditions of an economy. In addition, monetary policy changes led to long-run reversals among poor performing firms.*

Practical value: *The study contributes to momentum theory. It is recommended that further research do a detailed examination of the relationship between firm characteristics and long-run reversals under various monetary conditions. Monetary conditions are worth watching for when constituting a portfolio because they create arbitrage opportunities for astute investors.*

Corresponding author: Rollins NG Ayaya
Email address for the corresponding author: rollins.ayaya@gmail.com
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Introduction

There has been significant research on long-run stock reversals in US and European equity markets. There is wide-ranging evidence showing a tendency for equity instruments that perform well in the

previous six to twelve months to perform well in the subsequent six to twelve months. Garcia-Feijoo and Jensen (2014) examined reversals during two monetary environments, namely expansionary and restrictive monetary environments. Monetary environments are critical in determining liquidity-related issues. Garcia-Feijoo and Jensen (2014) did an extensive study on the effect of long-run reversals on firms in the US. They extended the research of Fama and French (1996) by 17 years to determine whether reversals are still prominent in the US and the reason for their occurrence. Dyl et al. (2019) showed that investors overreact to non-information-based price movements and underreact to company-specific public comments.

Numerous studies investigated the relationship and effects of overreaction on share prices. Zaremba (2016) examined long-run reversals in 74 countries, including South Africa, but did not do extensive research on the Johannesburg Stock Exchange (JSE) index. However, Blackburn and Cakici (2017) did a similar study focused primarily on developed nations in the North American, European, and Asian regions. South African scholars, such as Page and Way (1992), Hsieh and Hodnett (2011), Muller (1999), and more recently, Britten et al. (2016), examined the overreaction theory in a South African context. They all concluded that reversals tend to occur due to overreaction. Different classes of shares (in the Chinese settings) with varying classes of clientele have been shown to have other monthly share price reversals. Institutional ownership strengthens momentum in B shares (Chui et al., 2021).

Context

South Africa has a different monetary framework from to the US. This difference could yield different results than the previous US study by Garcia-Feijoo and Jensen (2014). Nominal interest is heavily dependent on the inflation rate because both the real interest and inflation must be added to calculate nominal interest. South Africa's monetary policy framework is different from that of the US, which potentially impacted the study and can be the reason South Africa's empirical findings are different to that of the US. According to the South African Reserve Bank, monetary authorities use inflation targeting to achieve their monetary policy objectives instead of other frameworks, such as nominal income targeting and exchange rate targeting. The South African Reserve Bank has been using inflation targeting as a monetary policy framework since 2000. The US Federal Reserve, on the other hand, uses different tools. The US Federal Reserve's monetary policy promotes maximum employment, stable prices, and moderate long-term interest rates. The South Africa Reserve Bank pursues an inflation targeting policy that promotes stable prices. South Africa has experienced expansions and contractions of the interest rates, which could affect equity investment decisions, and ultimately, share price movements. This paper explored whether monetary policy changes affect the reversals of loser and winner stocks in the long run.

Problem statement

There have been studies on long-run stock reversals in South African markets, such as Page and Way (1992) andBritten et al. (2016), but none considered monetary conditions. Long-run stock reversals are the tendency of firms with poor share performance to eventually outperform companies with good share performance over the past five years. The research on reversals has the limitation of not examining other effects of reversals, such as the conditional monetary effects, which this paper aimed to delimit. We considered the need to factor in various monetary conditions (restrictive and expansionary) alongside different firm characteristics to examine the reasons behind their reversals. Restrictive monetary policy deals with reserve bank mechanisms to slow inflation or economic growth through restricted liquidity. Firm features included firm size (measured by market capitalisation), book-to-market equity (BEME) ratio, and firms with high and low beta stocks. Most liquid and large companies were noted to have significant share price reversals (Rif & Utz, 2021). It is worth asking whether considerable share price reversals are associated with monetary policy conditions? US monetary tightening is a single global factor

that explains the variation of risky asset prices worldwide (Miranda-Agrippino & Rey, 2020). Therefore, this paper asked to what extent does monetary conditions in South Africa explain the variations in share prices on the JSE?

The aim of the study

This research explored monetary policy transmission through monetary conditions (within financial intermediation) and prices. This area has not been sufficiently covered using South African data. The research aimed to determine if monetary policies affect long-run reversals in South Africa. The findings will help equity investors better understand the JSE market and interface with the monetary policy regime. Finance professionals will be able to take advantage of the potential arbitrage opportunities at hand if the long-run reversals are a phenomenon among JSE-listed companies.

Literature survey

Past scholars have noticed the long-run reversal effects in various equity markets worldwide over the past few decades. The literature offers multiple explanations for the observed pricing trends following price movements, such as liquidity, overreaction, and underreaction postulates. There have been intensive studies focused primarily on US markets, and more recently, on Asian and European markets (De Bondt & Thaler, 1985; Fama & French, 1996; Garcia-Feijoo & Jensen, 2014; Britten et al., 2016). One of the main reasons behind the reversals is overreaction (De Bondt & Thaler, 1985), in which equity investors attach significant importance to current information. However, according to Garcia-Feijoo and Jensen (2014, p. 4), one of the explanations behind these long-run reversal patterns is rational, economic investor behaviour. They stated that "stock return expectations are affected by time variation in the funding conditions for investors and firms". Garcia-Feijoo and Jensen (2014) primarily investigated the relationship between monetary conditions and long-term reversals in stock prices for winner and loser stocks in the US markets. In South Africa, Britten et al. (2016) examined the overreaction hypothesis in which equity investors overweigh current events and underweigh historical information. The alternative explanations to the share price reversals are discussed in the following sections.

Overreaction theory

De Bondt and Thaler (1985, 1987) are leading critical authors who examined overreaction in equity markets. They used equally weighted monthly return data from the New York Stock Exchange between 1926 and 1982. They concluded that shares with a prolonged period of poor performance in US markets somehow on average outperformed winners by 31,9% over the next five years. They stated that this was due to overreaction. Investors tend to become overly pessimistic about stocks that perform poorly and excessively optimistic about superior performance equity securities. South African researchers Page and Way (1992) looked at the stock market reaction from a South African perspective and found that stock markets show overreaction. It was believed that overreaction behaviour is due to investors paying too much attention to recent dramatic news. In Page and Way's (1992) study, on average the prior loser portfolios outperformed the winners by about 20% over the three years after portfolio formation. The authors' results were consistent with the overreaction hypothesis, which predicts that traders tend to overreact to unexpected and dramatic news events, whether good or bad. Page and Way (1992) believed the findings suggested a substantial weak form of inefficiency in the South African stock market over the long-term horizon.

Muller (1999) also examined overreactions in South Africa and acknowledged that the JSE is no exception to weak-form inefficiencies. Muller (1999) concluded that investor overreaction to the JSE was evident. The loser portfolios in their study yielded higher excess market returns, and the winner portfolios

yielded lower excess market returns with an increased holding period. It is worth asking whether the information used by the investors includes liquidity information?

Hsieh and Hodnett's (2011) extended Page and Way's (1992) research in the JSE markets, and their empirical results agreed that overreaction of stock prices was present. However, the overreaction hypothesis contradicted the efficient market hypothesis in South Africa. De Bondt and Thaler's (1985) weak-form efficient market hypothesis states that investors cannot consistently outperform the market using historical price patterns. It is believed that investor overreaction systematically causes market prices to overshoot (De Bondt & Thaler, 1985). The reversals of share prices should thus be predictable to provide arbitrage investment opportunities. Therefore, Hsieh and Hodnett (2011) believed that the overreaction hypothesis directly contradicts the efficient market hypothesis. The period covered by De Bondt, and Thaler's (1985) study relates to the period affected by economic sanctions against the apartheid regime.

Blackburn and Cakici (2017) examined overreaction in 23 developed countries in North America, Europe, Japan, and Asia. Despite Japan being geographically located in Asia, it was categorised separately due to its heavy market-capitalisation presence. The European countries were Germany, the UK, Portugal, and Austria and the Asian countries included Singapore, Hong Kong, New Zealand, and Australia. In an equally weighted portfolio, the long-run reversals were present and statistically significant for North America, Japan, and Asia, yet insignificant for Europe. The strategy of longing winners and shorting losers in the long-term yielded a statistically significant average monthly return on -80 basis points over the sample period in North America. This, therefore, suggested that the reversal phenomenon is due to making a loss from taking a long position in the winner portfolio. Japan and Asia yielded similar results. We submit that the use of monthly return data should have been affected by monetary conditions, which we look at next. The studies reviewed did not consider different forms of shares and their clientele classes.

Monetary conditions

Bjørnland and Leitemo (2009) reported a considerable simultaneous interaction between the interest rates and shocks to share prices in the US. Garcia-Feijoo and Jensen (2014) supported this by registering returns for expansive and restrictive monetary environments from 1963 to 2010. They looked at the returns of a portfolio of stocks in the long position (loser quintile) and stocks of the short position (winner quintile). This portfolio was referenced as 'loser minus winner' (LMW). They also reported on monetary and reserve aggregates across the two aggregates.

A restrictive monetary condition exists whenever the reserve bank slows economic growth through reduced liquidity. The reserve bank does this by lowering the amount of money and credit banks can lend by making loans, credit cards, and mortgages more expensive. Reduced liquidity should make inventors sell their portfolio holding to access cash flows, leading to share prices declining because of oversupply. Expansive monetary condition is the direct opposite and aims to increase aggregate demand and economic growth in the economy. The reserve bank does this by cutting interest rates or increasing the money supply to boost economic activity. Ayaya (2002) contended that real economic growth is Granger caused by domestic credit to the private sectors, which is affected by the monetary policy. Odada et al. (2000) showed that inflation is an imported phenomenon in the countries in the rand monetary area.

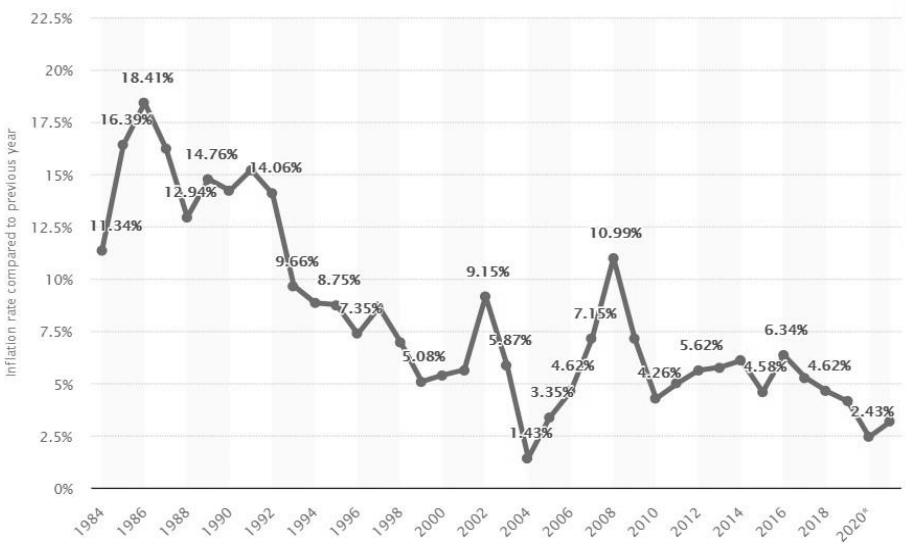
South Africa's monetary history

South Africa and the US have different economies, and therefore, differences in monetary policy frameworks may affect the results of this study compared to that of Garcia-Feijoo and Jensen (2014). Monetary policy frameworks generally depend on the following three things: (i) Structural differences, (ii) varying degrees of indexation, and (iii) institutional arrangements and analytical constraints (Fry et al., 2000). Structural differences are a significant factor because they involve the structure of a country's financial sector, debt levels, and fiscal discipline, which are different between them.

In the duration (1963 to 2010) of Garcia-Feijoo and Jensen's (2014) study, the monetary policy tools varied from maintaining fixed exchange rates post World War II to money supply targeting in the 1970s. According to the US Federal Reserve (2020), when the US Federal Reserve maintained a fixed exchange rate, it offered to buy or sell a unit of domestic currency for a set amount of foreign currency. A country that maintains a fixed exchange rate compared to another country has the same inflation as the foreign country. Therefore, countries with volatile or high inflation preferred to link their monetary policy, using the fixed exchange rate, to an economically robust country like the US or Germany. During the 1970s, monetary supply targeting was used. The technique used by the US Federal Reserve expands the money supply at a pre-specified and fixed rate over time. This method is used to limit the chances of inflation over time. The US experienced heavy inflation in the 1970s, which lead to using this technique (US Federal Reserve, 2020).

South Africa has been using inflation targeting as their monetary policy framework for the 21st century. Inflation targeting is a central banking strategy that sets an inflation rate goal and adjusts the monetary policy to achieve that goal. The objective of inflation targeting is to maintain price stability and support economic growth and stability. It has been proven by Statista (2020; Figure 1) that South Africa's inflation has experienced severe fluctuations, proving the existence of inflation targeting. The inflation ranges from 1,43% to 10,99% between the years 2000 and 2020. Figure 2 highlights the correlation between interest rates and inflation. As inflation increases, interest rates tend to move in the same direction, proving the positive relationship between the two variables between 2000 and 2020. South Africa's inflation has proven to be more volatile than that of the US because the US has been trying to target its inflation levels at 2%.

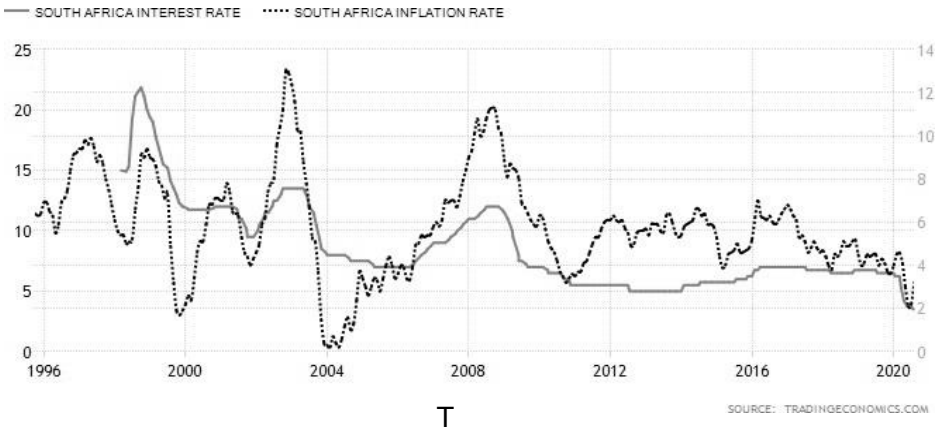
Figure 1: South Africa's interest rate compared to the previous years



Source: Statista (2020)

Figure 2: Comparison of the relationship between South Africa's interest rate and inflation

Inflation



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Source: tradeeconomics.com

Firm characteristics, monetary conditions, and long-run reversals

The long-run reversal of share prices in the US also experienced effects by firm characteristics (Garcia-Feijoo & Jensen, 2014). Firm features included firm size (measured by market capitalisation), various BEME ratios and firm betas. Garcia-Feijoo and Jensen's (2014, p. 16) previous research found that the monetary environment is expected to have a more "prominent influence on firms that have limited access to capital and firms that are heavily reliant on external sources of capital".

The reversal phenomenon was more definite for small firms compared to big firms. Firm size and BEME can both be viewed as a proxy for a firm's access to capital (Garcia-Feijoo & Jensen, 2014). Fama and French (1992) suggested that firms with relatively high BEME are more frequently financially distressed than firms with relatively low book-to-market equity (BE/ME). Banko et al. (2006) found that high-BE/ME firms (also known as value firms) tend to have a more significant earnings uncertainty, higher leverage, and a greater tendency to reduce their dividend. Fama and French (1993) supported this theory by reporting that BE/ME is a proxy for risk, and the higher the BEME, the riskier the firm. Financially distressed firms face more significant problems when attempting to secure financing. Thus, there are more reasons to expect a major reversal for firms with high BE/ME ratios. Garcia-Feijoo and Jensen's (2014) reported that reversals are conditional on the monetary environment. They learnt that losers only reversed when monetary conditions were expansive. Meanwhile, winner reversals are commonly isolated within restrictive environments. Secondly, the reversal of loser stocks was found to be driven by the price movements of small-capitalisation stocks (small firms), high-BE/ME stocks (high-value firms), and stocks with high systematic risk. It was found that a significant loser reversal was mainly identified when the monetary environment was expansive. Like the loser reversal, winner reversals are limited to stocks with a small market cap, growth features, and high systematic risk.

The anomalies in the securities exchange

Anjum (2020) provided results of three market anomalies (day-of-the-week effect, weekend effect and month-end effect) using data from the Pakistan and Karachi Stock Exchanges. Their results show that December and March returns are high on the Karachi Stock Exchange and Pakistan Stock Exchange, respectively. The month of January is also known to significantly affect share prices on other securities exchanges. However, researchers have yet to determine why January drives superior returns.

Reversals are also frequently and significantly affected in January. De Bondt and Thaler (1987) and Grinblatt and Moskowitz (2004) reported that long-run reversals for losers are more concentrated in

January. The January anomaly has been attributed to tax bases in the relevant jurisdictions. The end-of-year, tax-based trading decisions may be responsible for the reversal pattern exhibited by losers. George and Hwang (2007) confirmed this theory and concluded that loser stocks' long-run reversal is exclusive to January. These systematic trends in the securities market contradict the efficient market postulates because market returns can be predicted from known trends and not from publicly available information. Arendas et al. (2021) showed that the January effect has a significant influence on security prices in Eastern European markets.

Momentum theory

The momentum effect refers to the inclination of equity securities that performed well in the previous half-year to a year to perform well in the subsequent half-year to a year (Chui et al., 2021). The momentum phenomenon is when security prices experience accelerated changes and are expected to continue these changes in the future. Chui et al. (2021) contended that these trends are in harmony with a situation where momentum is caused by informed investors who underreact to information signals and that short-term reversals denote premia to incorporate the demands of those who demand short-term liquidity. It was found that the investor behavioural biases that cause short-term momentum are the same as those that cause long-term reversals (Hong & Stein, 1999). However, George and Hwang (2004) found that the anomalies are separate and concluded that the two return patterns are distinct phenomena and are encouraged by different investor behaviours. Predicting future returns from past returns can be attributed to clientele groups with different investment objectives; for instance, pension funds could contribute to momentum effects.

George and Hwang (2004) proposed two investor behavioural biases, anchoring and reference points, to explain price momentum, but they found that these behavioural biases do not explain long-run price reversals. However, according to Page et al. (2013), there is evidence of both a short-term momentum effect and the beginnings of a longer-term reversal. Page et al. (2013) reported that price momentum is present in the JSE. The authors investigated short- and medium-term momentum strategies in the JSE from January 1995 to December 2010 and reported a significant momentum effect on the JSE over the studied sample period, yet the magnitude of profits declined in the latter half of their sample. There is evidence of both a short-term momentum effect and the beginnings of a longer-term reversal, proving a relationship between the two. We postulate that the phenomenon observed could be associated with institutional constraints unique to the JSE; for example, the foreign exchange controls and liquidity situation could make investors operate within different clientele groupings.

Description of overall research design

Market players act on publicly available information that affects share prices. The overall study design was motivated by a study by Garcia-Feijoo and Jensen (2014), who linked the existence and stringency of long-term reversal patterns to monetary conditions. Specifically, it was essential to test whether there is a long-run share price reversal pattern in South Africa and whether it is influenced by a firm's access to financing and the monetary environment in South Africa. The study used quantitative methods to explore share price reversals while factoring in monetary policy changes. The study adapted Garcia-Feijoo and Jensen's (2014) US study to a South African context to establish whether their findings are universally acceptable. The researchers are positivists and believe that knowledge can be generated from reality and data independent of the research.

Data and methods

Sampling and data collection

Daily data for securities listed on JSE was obtained from the Bloomberg terminal for the period January 2000 to December 2019. This period is long enough to identify loser and winner stock and build the test portfolios. The daily data from the terminal included closing share price, price to earnings ratio, and the market capitalisation of shares. There were 458 firms in our sample.

The South African Reserve Bank obtained the 91-day treasury-bill (T-bill) return rate and used it to proxy the risk-free rate. Since the 91-day T-bill was reported as an annualised return, it was geometrically divided into daily returns. The J203T (JSE all share index return code) abbreviation for was obtained from Bloomberg and used to represent the benchmark market return.

The discount rate of South Africa was used to identify the monetary environment, which was also obtained from the South Africa Reserve Bank. The repurchase rate in South Africa was used to proxy the discount rate. The discount rate was used as the indicator of policy stringency because of Bernanke and Blinder's (1988) findings that several studies model the influence of monetary policy on financial market participants through the impact on bank lending rate or the availability of money. Discount rates define returns on cash savings, and investors in shares are bound to expect returns on risky portfolios to exceed interest rates on savings.

The construction of small minus big and high minus low portfolios

Fama and French (1996) found evidence suggesting that the three-factor model captures the economic essence of losers and winners. Furthermore, they contended that losers load more heavily on the small minus big (SMB) and high minus low (HML) portfolios. Based on this finding, it is important to test whether South Africa has the same phenomenon. The following equations show the details of the process of building SMB and HML portfolios.

$$SMB = \frac{\left[\left(+\frac{S}{M}+\frac{S}{H}\right)-\left(\frac{B}{L}+\frac{B}{M}+\frac{B}{H}\right)\right]}{3}$$

$$HML = \frac{\left[\left(\frac{S}{H}+\frac{B}{H}\right)-\left(\frac{S}{L}+\frac{B}{L}\right)\right]}{2}$$

For this study, all the shares were divided into two groups (big and small size) by comparing each share to the median. If the market value of shares was more significant than the median, they were placed into the big size group, and if the market value of shares was smaller than the median, they were put into the small group. The reason for choosing the median instead of the mean was that the market value of the JSE Top 40 takes up a large percentage of market capitalisation (over 90%) in the total market value of the sample, and therefore, there were two groups for the shares' market value for each period, big and small.

Furthermore, all the shares were separately divided into three groups (high, medium, and low) according to their price-earnings (P/E) ratios. For each period, all the shares' P/E ratios were compared within each group and were then further divided into the following three groups: high P/E (top 30%) group, medium P/E (middle hierarchy from 30% to 70%) group, and low P/E (bottom 30%) group (Figure 3). The holding period for both portfolios is from year 't' to year 't+1', and all shares were divided into these six groups (B/L, B/M, B/H, S/L, S/M, S/H), which are based on their prior market value and P/E ratio during the lookback period from year t-1 to year t. The equal-weighted return rate of these six groups was calculated in each trading month and strung together to form the portfolio returns from 2005 to 2019 (totalling 169 months, which is the same as the following LMW portfolios). The total amount of monthly returns used in the sample was 77 402, which was calculated by multiplying the 169-month sample period by 458 firms. Table 1 shows the available numbers of each group.

Table 1: Available numbers in each portfolio group

B/H	B/M	B/L	S/H	S/M	S/L
4678	4464	3880	2542	2924	5839

Figure 3. The evolution of the R1 invested in HML, LMW, SMB, and market risk premium portfolios under restrictive and expansive monetary conditions

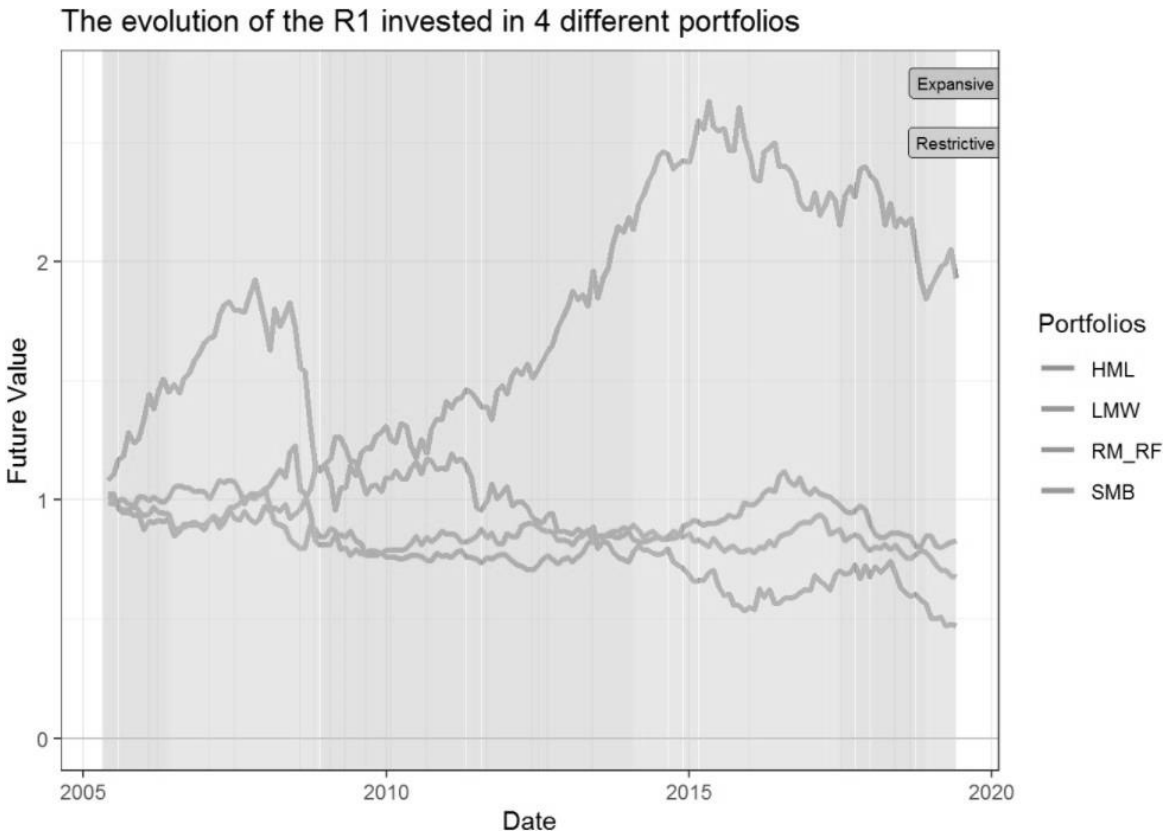
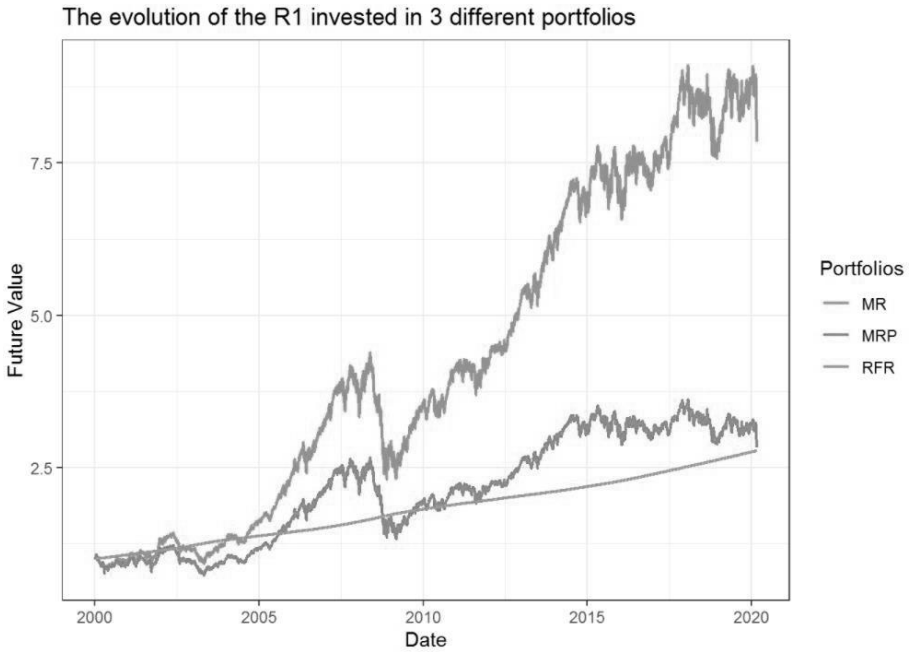


Figure 4. The evolution of the R1 invested in J203T (market benchmark), 91-days bills (risk-free) and market risk premium



Meaning and delimiting winning and losing portfolios

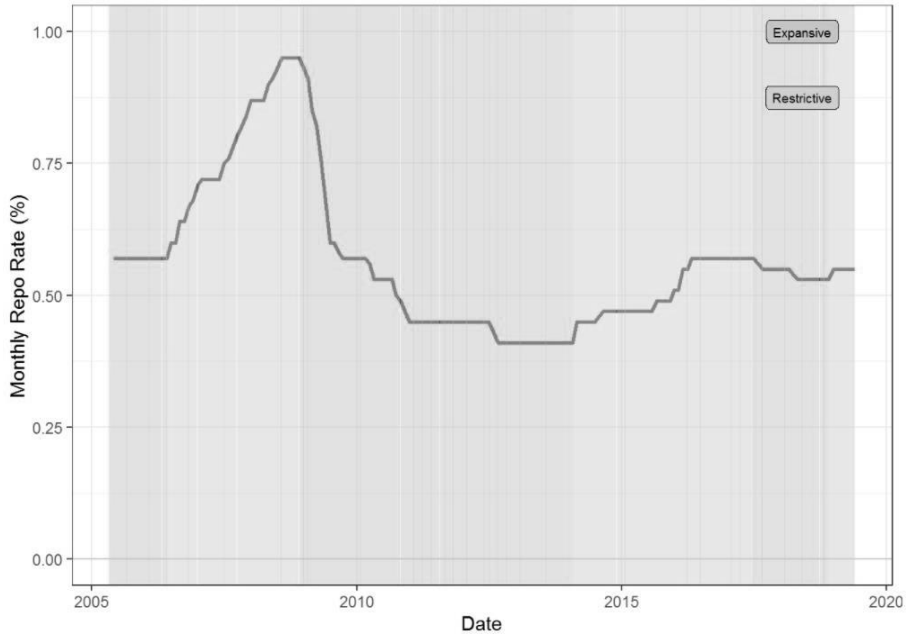
We looked at sample shares from a specified date and defined this date as the portfolio-formation date (t = 0). Then the cumulative excess returns for the prior 60 months to the last 13 months (the portfolio-formation period) was determined. The cumulative excess returns were ranked from low to high. The selection of the portfolio-formation period is in line with the findings reported in Fama and French (1996). They determined that the most significant long-term reversal exists when the formation period is based on share returns from month -60 to month -13 (Figure 3), relative to the evaluation period, which is a five-year lookback period, except for a one-year skip period. This allowed us to separate the influence of short-term price momentum from the long-run reversal effect. For example, the lookback period of the first performance interval started from 2000 to 2003 (four years). The holding period was the whole year of 2005, and the data for 2004 were excluded to avoid the potential influence of short-term price momentum.

Firms in the top 20% were assigned to the winner portfolio, and the firms in the bottom 20% were given to the loser portfolio, which is consistent with what Garcia-Feijoo, and Jensen (2014) did. After defining all the loser and winner groups from 2005 to 2019 (a total of 169 months), the next step was to calculate the return rate of the LMW portfolio. The grouping of each holding period was based on the previous performance through a four-year formation period. The equal-weighted monthly return could be quickly figured out by simply using the losers' portfolio minus the winners' portfolio. Finally, they have strung them together to form the LMW portfolio monthly returns from 2005 to 2019 (169 months) as shown in Figure 4.

Meaning of the monetary condition

The repurchase rate was used as the proxy for the discount rate in South Africa. The changes in discount rates were viewed as the shifts in the South African broad monetary policy. For the periods when the discount rate increases, we argued that this period is restrictive, where the general approach is constraining. For the periods where the discount rate decreases, we assumed that this period is expansive, and that the broad policy is unrestrictive. We defined the monetary environment as restrictive if the discount rate is signalling constraining conditions where the discount rate is increasing. Furthermore, we classified an expansive environment when the discount rate is decreasing. For example, conditions are expansive when the discount rate decreases from month t-1 to month t. There was a sharp shift before and after the financial crisis in 2008 (Figure 5). Furthermore, monetary conditions were considered maintained for the months in which the discount rate is unchanged.

Figure 5: The movement of the repo rate in South Africa from 2005 to 2019 (14 years) and the restrictive and expansive monetary conditions during this period



The analytical framework consideration

Fama-French three-factor with January dummy model

The Fama and French three-factor model was used because Fama and French (1996) found evidence that the three-factor model captures the economic essence of losers and winners. Specifically, they contended that losers behave similarly to small, distressed shares, and thus, losers load more heavily on the SMB and HML factors. In addition, several authors produced evidence that the LMW premium is strongly influenced by returns in January (Garcia-Feijoo & Jensen, 2014). In Fama and French's three-factor regression model, the SMB and HML risk factors are constructed by forming portfolios that are rebalanced monthly.

The portfolios were built based on the past cumulative excess returns, which allows for an investigation of the relation between reversal returns and the Fama-French three factors. This was done

while considering the January effect. The influence of January has been proved in many studies (Anjum, 2020). Consequently, it was viable to see whether it would be relevant in the context of South Africa using the following equation:

$$R_i - R_f = a_i + b_i\,(R_m - R_f) + s_i SMB + h_i HML + j_i(January\ Dummy) + e_i$$

Where RM – R_f = the excess return on a broad market portfolio.

SMB = the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks

HML = the difference between the return on a portfolio of high-carrying amount-to-market equities and the return on a portfolio of low-carrying amount-to-market equities

b_i, s_i, and h_{it} = the slopes in the regression model

Fama-MacBeth model

In this cross-sectional study section, the Fama-MacBeth model was used to test the relation between the return of loser and winner portfolios and the reversal returns. The findings were separated into the different monetary conditions and excluded or included the January influence, as mentioned above. The empirical study was divided into two steps based on the Fama-MacBeth regression method. Firstly, the cross-sectional regression was used to obtain the alphas and betas at each time 't', and then we calculated the time-series average of these three coefficients. Here, the factor is the dummy variable of winners' and losers' portfolios. These processes were done at once as traditional cross-sectional regressions. Secondly, the one-sample t-test model was used on each coefficient (alpha, and loser's and winner's beta) to test whether the true mean of each coefficient was statistically significantly different to zero. These processes were done at once as traditional cross-sectional regressions. In the Fama-MacBeth method, the time-series average of corresponding coefficients represents the coefficient estimate, as shown in the following equation:

$$Rit = \beta 0, t + \beta 1, t\ Loser, i + \beta 2, t\ Winner, i + e, it$$

Results of analysis and discussion

The evidence of reversals

Before examining the monetary policy effects of share reversals, it was imperative to determine whether reversals were present in the JSE over the 14-year sample period. Like what Garcia-Feijoo and Jensen (2014) did, firms were allocated into quintiles (five groups) based on continuously compounded returns during the portfolio-formation period. The methodology states that the lowest past performance quintile is denoted as the loser portfolio, and the highest past performance quintile is marked as the winner portfolio. Table 2 reports the equally weighted average returns for past performance in all quintiles.

Following Garcia-Feijoo and Jensen (2014) and Fama and French (1996), the portfolio return was measured from the month *t*. This month was determined to be 12 months after the -60 to -13 formation period to separate the momentum effect from the effect of long-run reversals. An additional reason behind the -60 to -13 formation period is one of our primary objectives, which was to determine whether monetary conditions explain the long-run reversal phenomenon.

Table 1 shows the mean monthly returns regression results of portfolios from May 2005 to May 2019. It shows that the losers failed to outperform the winners' portfolio by 34 basis points. This means that firms with historically good performance have consistently been producing superior returns to firms with historic lousy performance. This observation contrasts with the findings of past research by Page and Way (1992) and Britten et al. (2016), who acknowledged the presence of long-run reversals. The finding shows the influence of institutional investors. These outcomes could be due to differences in time frames and

external political and economic influences. In addition, Page and Way (1992) used a different metric to determine long-run reversals. They used a three-year formation period for their regressions, resulting in a 20% outperformance of LMW portfolios Britten et al. (2016) used a different time horizon, and examined the period from 1 January 1998 to 30 June 2013, whereas the time horizon of this study was 2005–2019. Therefore, the differences in results could be due to the differences in the periods examined.

Table 2: Mean monthly returns and regression results for past performance portfolios in the JSE: May 2005–May 2019

	Reversal Portfolio					
	Loser	**P2**	**P3**	**P4**	**Winner**	**LMW**
Panel A. Mean Monthly Return for Past-Performance Portfolios						
Mean return	-0.10	0.35	0.21	0.34	0.24	-0.34
t-statistic	-0.28	1.16	0.68	1.13	0.72	-1.01
Panle B. Regression Results for Explaining Past-Performance Portfolio Returns						
a	-1.17***	-0.54***	-0.72***	-0.61***	-0.76***	-1.05***
b	0.87***	0.86***	0.86***	0.82***	0.94***	-0.05
s	0.90***	0.56***	0.59***	0.58***	0.52***	0.39***
h	-0.08	-0.06	-0.12*	-0.05	-0.01	-0.04
j	2.08**	-0.76	-0.23	0.29	0.05	2.06
t(a)	-4.06	-2.97	-3.45	-3.10	-3.68	-3.09
t(b)	11.73	18.35	16.07	16.07	17.77	-0.64
t(s)	8.22	7.96	7.38	7.70	6.67	3.51
t(h)	-0.80	-0.91	-1.81	-0.88	-0.19	-0.41
t(j)	2.08	-1.20	-0.32	0.42	0.08	1.74
R^2	0.46	0.67	0.60	0.61	0.66	0.10

Note: Panel A shows equally weighted average monthly returns (in %) for portfolios. They are divided into quintiles based on past performance. Following Fama and French (1996), portfolios are formed based on returns between months -60 and -13 relative to measurement month t. Panel B reports regressions of monthly excess returns for past performance portfolios on the Fama-French three factors. The three factors and dummy variables (January) are calculated as follows:

$$Ri - Rf = ai + bi(Rm - Rf) + siSMB + hiHML + ji(January\ Dummy) + ei$$

The final column presents results for the LMW in the JSE.

****Significant at the 1% level.*

***Significant at the 5% level.*

Garcia-Feijoo and Jensen's (2014) US study acknowledged the presence of long-run reversals. Their study saw the losers outperforming their winner counterparts by 90 basis points between 1963 and 2010. Fama and French (1996) discovered a 74-basis point gap between the losers and winners. As stated in the literature review, their study was a 17-year extension of Fama, and French's (1996) study and their results corresponded well.

In Panel B in Table 2, it is worth noting that the coefficient of the market risk premium and SMB factor are all positive and are statistically significant at the 1% level. This means that the market risk

premium and SMB factor positively influence excess return based on their different quintiles. The HML factor coefficient is negative and is much smaller than the above two-factor exposures. The HML factor slightly influences the excess return, and this influence is statistically insignificant. Based on these findings, we argue that the SMB and market risk premium factor could capture the excess return in the different quintiles. Fama and French (1996) found evidence suggesting that the three-factor model captures the economic essence of losers and winners, and these factors are the market risk premium (Rm-Rf), SMB and HML. They claimed that losers behave similarly to small, distressed stocks, and therefore, losers carry more weight on the SMB and HML factors of the three-factor equation.

In addition, De Bondt and Thaler (1987) and Grinblatt and Moskowitz (2004) found that January returns strongly influence the LMW premium; hence, we investigated the relationship between reversal returns and Fama and French's (1996) three factors with January effects in mind. To determine the impact of January on the loser, winner and LMW portfolios, January was later factored out of the equation to see if January has a significant, overweigh effect on the regression results. As shown in Panel B in Table 1, the coefficient of the January dummy factor is only statistically significant at 5% in the excess return of the loser portfolio, and this coefficient is positive. In other words, the January effect strongly influences the loser portfolio. The relationship between the January effect and the excess return of the loser portfolio is positive. This finding was also confirmed by De Bondt and Thaler (1987) and Grinblatt and Moskowitz (2004), which is explained in detail in Table 2. The adjusted R-square is relatively high in our regression model, with an average of 0.6, excluding the regression on the LMW portfolio, and therefore, the regression model we used fitted well.

The January effects

January has a history of producing superior returns in securities. As stated in the literature review, De Bondt and Thaler (1987) and Grinblatt and Moskowitz (2004) reported that long-run reversals hold significant weight in results in January. George and Hwang (2007) further confirmed this theory by stating that long-run reversals of loser stocks are significantly exclusive to January. Muller (1999) acknowledged the presence of overreaction in South Africa to a point where he needed to factor out January from his empirical research to determine the effect of the month on long-run reversals. The empirical results shown in Table 3 oppose previous findings and exhibit the consistent presence of loser reversals. In Table 3, Panel A has the whole year, including January, and Panel B excludes January to determine whether January has a significant effect on the outcomes

Table 3: Long-run reversals and January returns in the JSE

	β0	Loser	Winner
Panel A. Full sample			
Coefficient	-0.3412	-0.4027*	-0.0587
t-statistic	-1.1899	-1.4680	-0.3083
Panel B. January Excluded			
Coefficient	-0.2752	-0.5865**	-0.0741
t-statistic	-0.9653	-2.0989	-0.3707

Note: The table shows the results of monthly Fama-MacBeth (1973) regressions of the form:
$R_{it} = \beta_0, t + \beta_1, t\ Loser, i + \beta_2, t\ Winner, i + e, it$

The R_{it} is the return to stock i in month t. Loser (winner) is a dummy variable that takes the value of 1 if stock i is in the lowest (highest) quintile based on their continuously compounded returns from month -60 through the month -13. At the top of Table 2, loser and winner mean the corresponding coefficient estimates, calculated by the time-series average, in %. The portfolio-formation period of our samples is from May 2005 through May 2019 (169 months).

***Significant at the 5% level.*

**Significant at the 10% level.*

Panel A in Table 3 shows that the loser reversals failed to rebound with a 40.27-basis point drop in returns, and Panel B shows that the losers experienced a further reduction of 58,65 basis points, excluding January. This 18.33 basis point difference confirmed our findings in Table 2 that the January effect has a significant influence on the loser portfolio. Garcia-Feijoo and Jensen's (2014) January effect results were consistent with De Bondt and Thaler's (1987) and George and Hwang's (2007) theories. Their results confirmed a strong existence of long-run reversals over their 571-month sample period. The returns for losers generally rebounded by 59 basis points but dropped remarkably to 15 basis points after factoring out January, while winner reversals experienced a 31-basis point drop. As shown in the last column in Table 3, the winner's portfolio too failed to yield a reversal with negative coefficients of -5,87 basis points and -7,41 basis points. However, these results were shown to be statistically insignificant. Based on those findings, this finding is the same as that in Table 2, where we found that the mean monthly return of the LMW portfolio is -0,34%, which means that the winner portfolio keeps performing better than the loser portfolio. In other words, the long-run reversal of loser and winner does not exist in South Africa, but the January effect does affect the loser portfolio's return.

The monetary environment and long-run reversal

Table 4: LMW returns under expansive and restrictive monetary environments

	Expansive (n=92)	Restrictive (n=77)	T-statistical
LMW portfolio return	-0.6252%	-0.0080%	0.9003

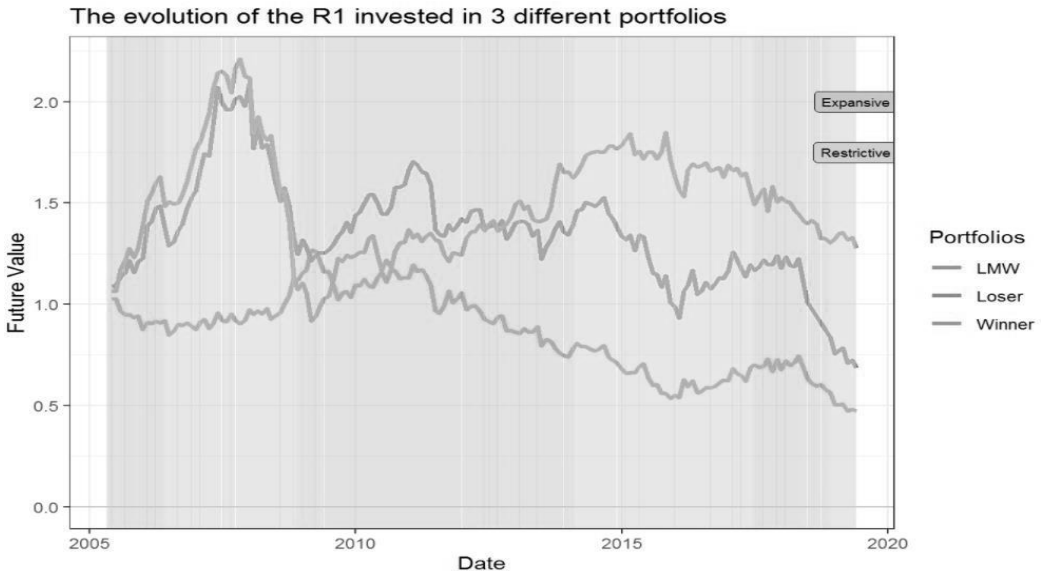
Note: Table 4 displays average monthly returns for the LMW portfolio in expansive and restrictive monetary periods. Following Fama and French (1996), loser and winner portfolios are determined based on continuously compounded returns between months ranging between -60 and -13 relative to the portfolio-formation period month t. The sample portfolio-formation period is from May 2005 to May 2019 (169 months).

We ran the two-sample t-test to examine whether the mean of the LMW is significantly different under both monetary conditions. Table 3 shows the LMW returns during both the expansive and restrictive monetary environments. It shows that loser reversals are not as evident, and the mean monthly return of the LMW portfolio shows a -62,52 basis point balance during the expansive period and a -0,70 basis point during the restrictive period. This slight increase in the latter period may suggest that a reduction of liquidity and money supply encourages individuals to invest more in loser portfolios, which gradually increases their share returns. Figure 6 supports Table 3's findings of a constant underperformance with the loser line of monthly returns consistently falling below the winner line for the most part, except at the beginning of the financial crisis when the South African Reserve Bank implemented an expansive monetary policy that boosted the loser portfolio. Furthermore, the LMW portfolio line exhibited a spike at the beginning of the 2008 global financial crisis but then started to experience a decline.

The LMW returns discovered by Garcia-Feijoo and Jensen (2014) were at 1,85% during the expansive period. However, it was less than half the size at 0,48% during the restrictive period. Based on those

findings, they argued that monetary conditions strongly influenced the long-run reversals. In other words, there was a solid long-run reversal in share prices when the conditions were expansive in the US markets (during their 571-sample month period). On the contrary, the mean reversal findings were significantly diminished when the economic environment was restrictive.

Figure 6. The evolution of the 1 rand invested in loser, winner and LMW portfolios



Considering South Africa's monetary environment, the empirical study separated the Fama-MacBeth regression results into the two types of monetary environments (expansive and restrictive). Table 5 builds on Table 3 by looking at the effects of the monetary environment on the long-run reversals of the JSE-listed firms. Table 3 only shows whether reversals were present over the sample period, but Table 5 shows how the results differ when taking South Africa's monetary environment into account.

Table 5: Long-run reversals under both monetary environments in the JSE

	Expansive Conditions			Restrictive Conditions		
	β0	**Loser**	**Winner**	**β0**	**Loser**	**Winner**
Panel A. Full Sample						
Coefficient	0.3688	-0.7248**	-0.0996	-1.1896***	-0.0179	-0.0099
t-statistic	1.0804	-2.0308	-0.4017	-2.5667	-0.0423	-0.0335
Panel B. January Excluded						
Coefficient	0.4700	-1.0722***	-0.2140	-1.1568***	-0.0121	0.0915
t-statistic	1.3614	-3.0911	-0.8266	-2.5704	-0.0272	0.2935

Note: The table shows the results of monthly Fama-MacBeth (1973) regressions. The formula is presented as follows: $Rit = \beta 0, t + \beta 1, t\ Loser, i + \beta 2, t\ Winner, i + e, it$

The monetary environment is determined based on monetary policy variables, in which the repo rate of South Africa was used as the indicator. The monetary environment is determined based on monetary policy variables, in

which the repo rate of South Africa was used as the indicator. Where Rit is the monthly stock return i in month t, loser (winner) is a dummy variable that takes the value of 1 if the stock is in the lowest or highest quintile based on continuously compounded returns over months ranging between -60 and -13. Where Rit is the monthly stock return i in month t, loser (winner) is a dummy variable that takes the value of 1 if the stock is in the lowest or highest quintile based on continuously compounded returns over months ranging between -60 and -13. w. In the table, loser and winner represents the corresponding (time-series average) coefficient estimates in %. The sample portfolio-formation period is from May 2005 to May 2019 (169 months).

****Significant at the 1% level.*

***Significant at the 5% level.*

Table 5 shows that when classifying reversals under the two monetary environments, the losers perform significantly worse under expansive conditions than restrictive conditions. Under expansive monetary conditions, the losers exhibited a 72.48-basis point drop in mean monthly returns but interestingly improved to a -1,79 basis point change under restrictive conditions. The loser results in expansive conditions were significant at the 5% level. This is counterintuitive to Garcia-Feijoo and Jensen's (2014) findings that losers significantly outperform winners under expansive conditions. Their study opposed these findings with an observed positive 1,51% loser reversal when the monetary environment was expansive but a drop in mean monthly returns to 0,18% when the monetary environment was restrictive.

Panel B in Table 4 excludes January to determine the difference in results when the power of the January effect is removed. Under expansive conditions, the loser shares failed to experience reversals with a 107,22 basis points drop at a 1% significance level. They performed worse when January was factored out. This supports the theory by De Bondt and Thaler (1987) that January month has a more positive effect on January returns. The losers did improve significantly to a -1,21 basis point level during the restrictive conditions. The winners still managed to produce better mean monthly returns during both monetary environments. The winners did experience poor performance during the expansive conditions but still managed to perform better than their loser counterparts. During the restrictive monetary conditions, the sample winners managed to generate positive returns at 9,15 basis points. In comparison, Garcia-Feijoo and Jensen (2014) found that winners' change in a mean monthly reversal in the US was negligible with a -0,37% reversal during the expansive conditions and a -0,30% mean monthly reversal during restrictive conditions. Excluding January in their study showed a significant drop in loser reversals from a 1,51% loser reversal in expansive conditions to 0,76% in the same environment. This confirms De Bondt and Thaler's (1987) and Grinblatt and Moskowitz's (2004) theory that long-run reversals for losers are more concentrated in January.

Conclusion

This research looked at the relationship between South Africa's monetary policy and the reversal returns of JSE-listed firms. Long-run stock reversals are when firms with poor share performance over the long run (five years) eventually outperform companies with good share performance. The research aimed to determine whether differing monetary policy environments (expansive and restrictive) influence the reversals of the JSE-listed firms in South Africa. An expansive monetary policy occurs when the South African Reserve Bank aims to stimulate economic growth by lowering short-term interest rates and expanding the country's money supply. On the contrary, restrictive monetary policy occurs when the South African Reserve Bank aims to combat inflation by raising short-term interest rates and limiting the money supply of South Africa. These two monetary environments had positive consequential effects in Garcia-Feijoo and Jensen's (2014) US study, where reversals occurred in the US markets and exhibited significant changes in results among loser and winner portfolios. The losers in the US outperformed

winners, especially during expansive conditions, but their outperformance was more limited during restrictive conditions. This South African study failed to find loser firms beating winners in both expansive and restrictive monetary conditions, and losers continuously underperformed in the long run but closed the gap during restrictive conditions. This disproved our hypothesis based on Garcia-Feijoo and Jensen's (2014) monetary findings and Page and Way's (1992) and Britten et al.'s (2016) acknowledgement of reversal occurrence in South Africa. January positively affected the loser portfolio because the losers did not perform as severely when January was included in the analysis. Once January was excluded, the losers performed a lot worse.

Limitations and recommendations

The limitation of the empirical research was that many firms did not have all the required data to do a complete sample analysis. The data was suggested to be converted daily; however, it was difficult to restructure the approach due to time constraints. It is acknowledged and understood that 42 250 data points are significantly more than 169 data points and may have given more conclusive results. However, the daily time-series data of market risk premium did yield a similar curve to our monthly time series. The holding period of the LMW portfolio is one year, which was inspired by Garcia-Feijoo and Jensen (2014). However, the results did not find long-run reversal patterns in the sample. Therefore, it is probable that this kind of reversal will show up if one expands the holding period. It is recommended that a more in-depth analysis of firm-specific factor effects in South Africa could help develop research in the field of monetary policy and price reversals. We also recommend that future research considers the tax and clientele effects on share price reversal.

The authors' substantive contribution(s) to the current conference article are in the table below.

Author name	Conceptualisation and design	Literature review	Data collection	Data analysis and interpretation	Manuscript writing	Critical revision of the manuscript	Obtaining funding	Overall responsibility
Rollins N. G. Ayaya	X	X	X	X	X			X
Runxin Lin	X	X	X	X				
Onesmus Ayaya		X			X	X	X	

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