The impact of regulatory fines on shareholder returns

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Corruption has been shown to undermine the efficiency of market-based economies by allowing participants to profit from illegal rent-seeking activities, which decrease public support for business and increase the cost of capital (Zingales, 2015). Over the past decade, the Competition Commission in South Africa has investigated and issued punitive fines amounting to around R8bn to companies engaged in non-competitive behaviour. Using event study methodology, we examine the impact on the share prices of listed companies upon the announcement of an investigation, a fine, and the payment of the fine. We find that shareholder returns were unaffected at the initiation and payment stages of the process, but that the returns were positively affected at the conviction stage. A buy-and-hold longitudinal study was also undertaken to determine if an ex-post portfolio consisting of stocks of convicted companies out-performed an equal-weighted all share benchmark, as well as a portfolio of matched companies which had not been fined. The results reveal that both the portfolio of fined companies and the matched portfolio of non-fined companies out-performed the market benchmark over a 24-year period. However, the portfolio consisting of convicted companies underperformed the portfolio of companies which had not been fined. We conclude that the market anticipated the fines and that the quantum of fines levied was less than expected. We also find that the non-competitive behaviour of convicted companies did not benefit their shareholders in the long-term.

Introduction

The most striking development in modern antitrust law is the global acceptance that cartels must be condemned as the market's most dangerous vice related to competitiveness (Kovacic, 2013). Over the past ten years, 12 Johannesburg Stock Exchange (JSE) listed companies have paid fines for anti-competitive behaviour, amounting in total, to almost R8bn (about 0.2% of current SA GDP). This figure is dwarfed by the $138bn paid by financial services firms (only) to US regulators between 2012 and 2014 (about 0.8% of current US GDP) (Zingales, 2015).

Di Tella and MacCulloch (2009) find that, controlling for country fixed effects, the more an individual perceives his country as corrupt the more he demands government intervention. They also find that increases in corruption in a country precede increases in voting support for populist, left-leaning parties. More recently, Zingales (2015:6-7) contrasts two types of finance: bad finance ("noncompetitive, plutocratic, and clubbish") and good finance ("competitive, democratic, and inclusive finance") and argues convincingly that bad finance is evidenced by increased rent-seeking activities and decreasing public support for business.

This study examines the impact on shareholder returns of companies listed on the JSE which have been found guilty of collusive behaviour by regulatory bodies, and subsequently fined. We examine the short-term effects of announcements relating to the process, and investigate whether or not shareholders gained from their anti-competitive behaviour despite the fines imposed.

Theory base and literature review

Rotemberg and Saloner (1986) present a model to show that collusion generally occurs in instances where there is evidence of unusually large demand and associated returns (thus where the benefit is substantial enough to motivate, and in some instances appears to justify, the collusive behaviour) (Rojas, 2012). In general however, companies willing to be associated with cartel-like behaviour are motivated by the forecasted illegal profits and potential gains from the venture, with total disregard for societal damage (Combe & Monnier, 2011).

Chotibhongs and Arditi (2012) find that firms involved in collusive behaviour may increase their bid to allow other participating parties to be awarded a contract, or refrain from entering a bid at all. These actions are taken by the participating firm in anticipation of an opportunity to earn higher profits in the future or contemporaneously, depending on the level of collusion.

Combe and Monnier (2011) argue that the actual cost to society as a result of collusive behaviour is very difficult to determine; and the reputational damage suffered by a convicted company also remains unquantifiable. The cost of equity and debt however, is influenced by corruption, and it has been found that a positive correlation exists between the level of corruption and the cost of debt and equity (Baxamusa & Jalal, 2014). Companies convicted of collusive behaviour and subsequently fined do not only have to contend with the imposed sum, but also have to deal with the substantial legal costs incurred through the investigation and defence of these charges (Currell & Davis Bradley, 2012). It can therefore be argued that for a convicted company (directly), and for

shareholders (indirectly), the total costs are greater than the actual imposed fine, but this does not mean that the ultimate benefits of collusion were uneconomic.

Another important factor in considering the impact of collusion is the sustainability thereof in the operating market. It can be assumed that the longer collusion has been allowed to prosper amongst companies, the greater the impact on society. Savorelli (2012) argues that the introduction of asymmetry in how substitution-effects influence the sustainability of collusion makes collusion difficult to sustain. These findings confirm the research of Martinez-Sanchez (2011), who finds that the sustainability of collusion is dependent on the existence of similarity amongst products in the specific industry.

Chotibhongs and Arditi (2012) propose a two-step method for detecting collusion as well as forecasting similar behaviour. The method systematically analyses historic data and bid information, and identifies suspected cartel-like behaviour amongst bidders. The first step consists of the identification of potential collusive bidders using residual and cost stability tests. The second step involves the comparison of bidders guilty of collusive behaviour and non-cartel bidders by analysing bid distributions, cost dispersion and finally the difference in cost structures.

The Competition Commission of South Africa states that collusion can be detected through the display of suspicious bidding patterns such as common mistakes through different bids, identical prices quoted in separate firms' bids, the failure to bid by certain contractors, and finally, when the lowest bidder does not accept the contract.

Mihai (2008) found that cartel-like behaviour can be identified through the analysis of trends and pricing in specific markets. The research, however, cautions that the uncovering and analysis of collusive activity and information can be difficult, which might lead to failures in such a diagnosis.

Marvel (1980) found that the general pattern of rates of return varies systematically and significantly between markets operating under competitive circumstances, and markets where cartel-like behaviour was observed. Further research conducted by Rojas (2012) concluded that collusion is highest in environments described as "most-certain". These are environments where demand information is known amongst competitors, and where historical information is easily obtainable for analysis. The construction industry is a prime example of such an environment. The inverse was also found to be true, in that collusion is at its lowest in "least-certain" environments (Rojas, 2012).

Regulation can be defined as the rules produced by administrative agencies, mainly through the notice-and-comment rulemaking process (Stack, 2012). This research explores events where rules have been transgressed, and a liability placed on the transgressor. It has been stated that regulation or antitrust laws are essential in market economies as they can be viewed as a means of preventing companies from distorting competition in ways that adversely affect the economy. Fines are crucial in enforcing these antitrust laws (Aguzzoni, Langus, & Motta, 2013).

Lean, Ogur, and Rogers (1985) argue that market forces can break down collusion without the interference of regulatory bodies, therefore indicating the possibility that collusion is not profitable, and that antitrust policy is ineffective and unnecessary. Their research concludes that antitrust agencies are effective in lowering the high returns gained by collusive behaviour, as well as reducing social losses incurred.

Mihai (2008) found that the main sectors in Europe influenced by restrictive competition in the form of collusion were the chemicals and construction materials sectors, with recent fines imposed on 10 companies by the European Commission in excess of €2.57 billion. Included amongst these companies was a South African cement producer, which was liable for a fine of €249 million for its involvement in collusion over plasterboard prices (Bodoni, 2010). More recently, the average fine imposed by the European Union (EU) per cartel was around €116 million (Combe & Monnier, 2011).

The EU has been increasing the size of fines imposed on cartels over the past few years to deter collusive behaviour, but concern remains amongst some analysts that there might be a risk of over-enforcement. When over-enforcement or excessive fines are issued, there is a risk that the company concerned is unable to pay the fine, ultimately reducing competition (Combe & Monnier, 2011).

Another way to combat cartels is by implementing leniency policies, which allow for a reduced fine or total amnesty should cartel members provide information and confess regarding collusive behaviour (Mihai, 2008). These policies have the potential to decrease the risk of over-enforcement, and may also provide the authorities with appropriate data to investigate and prosecute guilty parties. Research conducted by Bigoni, Fridolfsson, Le Coq, and Spagnolo (2012) as part of a laboratory experiment, found that antitrust enforcement without leniency reduced cartel formation, but increased the surviving cartels' prices.

The impact of disclosure of alleged collusive or illegal behaviour by companies on shareholder returns formed part of the research conducted by Cloninger and Waller (2000). One of their findings was that the initial confirmation by a company of its involvement in a collusive or illegal practice had a negative effect on that company's abnormal returns (Cloninger & Waller, 2000). In some instances the drop in market capitalisation exceeded the fines ultimately incurred by the companies.

Aguzzoni, Langus, and Motta (2013) found that, on average, a surprise inspection reduced the share price of an offending company by approximately 2.8%, with conviction having an impact of approximately minus 3.5%. In total it was found that antitrust action negatively impacted the firm's market value by approximately 3% to 4.5% (Aguzzoni *et al.*, 2013).

Further research conducted on the electrical equipment manufacturing industry, to establish if the existence of collusion increased the returns to the shareholders of these companies, found that the existence of collusion indeed increased the relevant returns to shareholders (Lean *et al.*, 1985). Although the increased returns were pertinent to certain sectors and products of the industry, the paper provided evidence that collusive behaviour can in fact be profitable and positively affect the returns to shareholders.

Research questions

Drawing from the literature, the main research question is stated as follows:

- Do regulatory fines have an impact on shareholder returns in South Africa?

In addition, two sub-questions are investigated:

- Do companies in different industries react differently to the announcement of regulatory fines?
- Is the quantum of the imposed fine sufficiently large to deter companies of repeat transgression, or do shareholders ultimately benefit from collusion?

Research methodology

Sampling and data collection

The data was accessed from the published information on the JSE of all listed companies convicted of collusive behaviour from January 1998 to August 2014. 1998 coincided with the formation of three independent regulatory bodies replacing the Competition Board, which historically was not independent of the Ministry of Trade and Industry and only possessed advisory powers. These bodies are the Competition Commission of South Africa (the commission), the Competition Tribunal (the tribunal) and the Competition Appeals Court (the appeals court).

The sample companies were identified from publicly available information from the tribunal's list of companies which had been investigated by the commission and adjudicated by the tribunal. This list enabled the identification of an approximate date of an investigation announcement as well as a date recording when the company was convicted or acquitted. The final event in the time-line is the imposition of the fine and the subsequent payment by the company.

Data analysis

The sample was analysed using event study methodology to determine if there were any significant changes in the abnormal returns of the share prices of the companies in the sample. The perception exists that the market effectively prices in the likelihood of a fine after the announcement date of an investigation, and that returns might therefore not be influenced when the actual fine is paid and the cost incurred. To test this perception we also examine the abnormal returns on the announcement date of the fine as well as the date on which the fine was actually paid.

The second tool for analysis was the use of so-called "buy and hold" portfolio analysis. This allows for a comparison of the performance of a buy-and-hold portfolio, constructed on the basis of an investment style (in this instance, investing in companies convicted of collusion) against various benchmarks. In this study we use style analysis as a *post-hoc* tool to analyse how shareholders *might* have done, had they had prior knowledge of a conviction by the tribunal. This is not an investment style that can be predicted *ex-ante*, but the methodology nevertheless provides useful insights of long-term performance.

Event study

An event study is a statistical study on how information affects share returns at a specific time (Harvey, 2011). It can further be defined as an empirical study performed on a security which has experienced a catalyst occurrence ("event"), which may have impacted returns in a positive or negative way.

The catalysts in the current research are the three identified dates, *viz:* the announcement date of an investigation by the commission on a company for non-competitive behaviour, the date of conviction or acquittal, and finally the date when the fine was paid by the convicted party. The event methodology allows for a short-term analysis of any changes in the relevant returns of the companies, and thereby for the determination of the impact of the investigation and subsequent fine on the shareholder's returns.

We follow the methodology of Ward and Muller (2010), who published research findings pertaining to the impact of Black Economic Empowerment (BEE) announcements by specific companies listed on the JSE. Event studies require the estimation of abnormal returns (ARs), typically on a daily basis. The usual approach is to use the single parameter Capital Asset Pricing Model (CAPM) to estimate the expected return on any day, and to subtract the actual return of the share on that day to estimate the AR as shown in equation 1:

$$ARit = \beta i * Rmt - Rit \quad (1)$$

where:

ARit is the abnormal return on share i on day t
βi is the beta of share i against the market
Rmt is the return of the market on day t
Rit is the return of the share on day t

The Ward and Muller (2010) methodology is to estimate abnormal returns (ARs) using 12 control portfolios, instead of the single parameter CAPM approach shown above. The

advantage of the control portfolio methodology is that it includes possible market effects (eg: size, value/growth, resource/non-resource) into the estimates the ARs and gives a more accurate estimate of the AR (Ward & Muller, 2010).

Generally in event studies, the ARs are consolidated into cumulative abnormal returns (CARs) over a period surrounding the event date (the event window), to allow for the possibility that the exact date is not known and to capture the pre-event and post-event market reaction (Kolari & Pynnönen, 2010). Although there is no particular guideline relating to the length of the event window, most event studies keep this to a minimum to avoid confounding events affecting the results. For the purposes of this research, a timeline of a month (22 working days), pre and post the event date is analysed to establish if a clear impact on share returns of the announcement of a collusion investigation can be determined. Following the approach of Ward and Muller (2010) we zero the CARs on the closing price the day prior to the event date (day t-1), subtracting the daily ARs before the event and accumulating the ARs after the event date (day t0).

Buy and hold analysis

The idea of buy and hold analysis is akin to that of style analysis, which, according to *Barclay Hedge* is to explain the set of returns of a specified fund with the reference to a set of style factors or behavioural indicators ("Style Analysis," 2014). Style analysis was developed to determine a mutual fund's investment style (i.e. value, growth, momentum, small-cap etc.) (Domian & Reichenstein, 2008). Swindler and Oehler, (2006) suggest several fields of application for style analysis methodology such as fund performance, evaluation, risk management and classification.

Muller and Ward (2013) conducted research on JSE-listed stocks over the period 1985 to 2011, with the aim of re-examining existing styles (previously identified in the literature) using an improved data set (due to the fact that some of the earlier data sets suffered from too-short time frames, too-long review periods, survivor bias and incomplete data). Their methodology lends itself to the analysis of long-term strategies for investment. We use this approach to determine whether or not a portfolio of companies which (*ex-post*) paid fines for non-competitive behaviour, out-performed two benchmark portfolios; an equal weighted portfolio of the largest 160 JSE listed companies, and a portfolio comprised of matched companies (in terms of sector, size, and listing duration) but which had not been fined.

Following the approach of Muller and Ward (2013) we treat the data as follows. To exclude the effect of survivorship bias, all shares ever listed on the JSE are included in the analysis, although we use only the top 160 in each quarter as our sample. Quarterly review periods are used to ensure that shares are included in the quarter following their listing, and dropped once delisted. Dividends are included and re-invested to calculate total returns. Share-splits and the effects of corporate actions on share returns are treated appropriately.

Using the full dataset, we construct an equal weighted benchmark index. We also construct an equal weighted portfolio of (only) those 12 companies convicted of collusion as portfolio A (adding those companies which were listed after 31 December 1979 once the data is available). Similarly, we construct portfolio B, being the benchmark portfolio of paired (not convicted) companies.

We compare the performance of portfolio A against the benchmarks and draw conclusions.

Results

Events

The study identified 12 companies which had been fined by the commission over the last 12 years. The number of events (fines) identified is 23, with subsequent sub-events equal to 69 (investigation announcement, fine announcement, payment announcement). The fines ranged from R0.115 million to R4.6 billion and include companies from the Oil and Gas, Construction and Materials, Food and Beverage, Telecommunications and Banking sectors on the JSE. The companies identified, as well as a brief description of the events, are shown in appendix 1, and a summary of the key details is shown in Table 1.

Table 1: Descriptive details of the sample

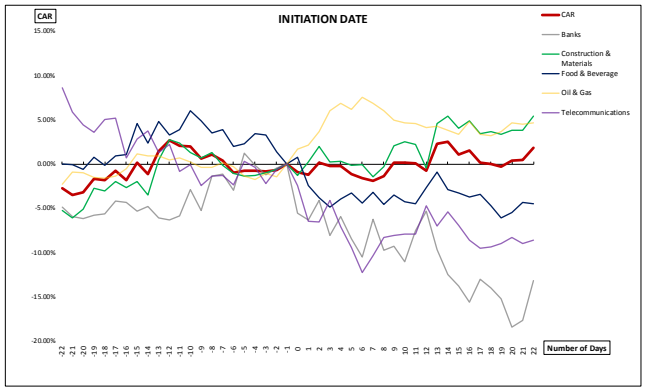
JSE Share Code	Company Name	JSE Nature of Business	Year of JSE listing	Number of fines	Total value of fines paid (Rm)	Paired Company JSE Code	Paired Company Name
AEG	Aveng Group Limited	Heavy Contr.	1999	4	504.0	MAS	Masonite Africa Ltd
BSR	Basil Read Holdings Ltd	Heavy Contr.	1987	1	95.0	PPC	PPC Limited
ESR	Esor Limited	Heavy Contr.	2006	1	0.1	AFT	Afrimat Limited
MUR	Murray & Roberts Hldgs	Heavy Contr.	1948	1	309.0	GRF	Group Five Ltd
PFG	Pioneer Foods Group Ltd	Food Prod	2008	2	596.0	ILV	Illovo Sugar Ltd
RBX	Raubex Group Ltd	Heavy Contr.	2007	1	59.0	CGR	Calgro M3 Hldgs Ltd
RMH	RMB Holdings Ltd	Banks	1992	1	2.1	NED	Nedbank Group Ltd
SOL	Sasol Limited	Int. Oil & Gas	1979	4	4 596.0	AFE	AECI Limited
SSK	Stefanuti Stck Hldgs Ltd	Heavy Contr.	2007	2	363.0	MZR	Mazor Group Ltd
TKG	Telkom SA SOC Ltd	Fixed Line Tel	2003	2	649.0	MTN	MTN Group Ltd
TBS	Tiger Brands Ltd	Food Prod	1944	2	151.5	SAB	SABMiller plc
WBO	Wilson Bayly Hlm-Ovc Ltd	Heavy Contr.	1988	2	321.2	DAW	Distr and Warehousing
				23	7 645.9		

(Table 1 provides a list of the 12 companies fined by the Tribunal, showing their respective sectors, the year in which each was listed on the JSE, the number of fines imposed on each company by the Tribunal, the total value of the fines and finally the paired company used as a benchmark in the analysis).

The total value of the fines imposed on the convicted companies referred to in Table 1 amounts to R7.6 billion, although the data is skewed. These fines were imposed and paid over a period of 12 years, from 2005 to 2014. Sasol received the biggest collective fine, totalling R4.6 billion, with Esor incurring a fine of only R0.12 million. The high proportion in the sample of construction and oil companies concurs with the findings of Mihai (2008).

The three figures below show the impact around the event date of the three above-mentioned sub-events, namely Figure 1 (The Initiation Date), Figure 2 (The Conviction Date) and Figure 3 (The Payment Date). The figures illustrate the CARs

(estimated using the control portfolio methodology of Ward & Muller, 2010) of the particular industry, a working month prior to and post the event. The figures also combine the various industries into a total sample CAR to establish the general trend pertaining to the event, and whether a clear impact can be determined.

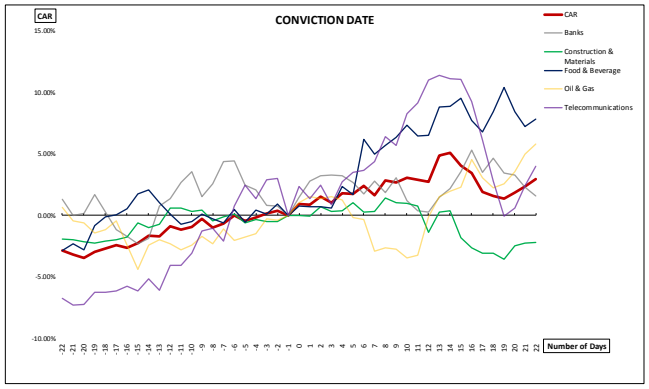


Source: JSE Bulletin Database

Figure 1: Cumulative abnormal returns around the announcement date of an investigation into collusion by the tribunal

Figure 1 shows that the overall trend of CARs around the announcement date is neutral across industries. The only two industries to reflect positive CARs on the event date (t0) are Oil and Gas (which gains around 5% over the next 10 days) and Food and Beverages (which reverts to a negative trend from day t+1). All of the other industries reflect negative CARs on the event date, with a combined CAR for all of the industries equalling -0.91% on day t0.

This negative trend continues over the subsequent trading month, except in the Construction and Materials industry where the trend becomes positive after about t+12. The industries impacted the most by the announcement of the investigation on the event date are Telecommunications (which falls by around 15%) and Banks (which falls by around 10%).

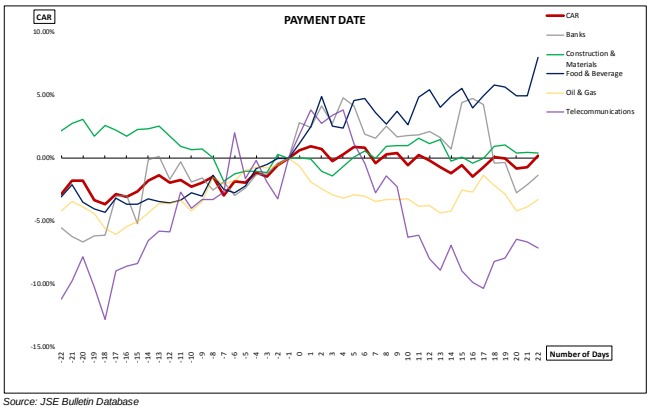


Source: JSE Bulletin Database

Figure 2: Cumulative abnormal returns around the announcement date of a conviction of collusion by the tribunal

Figure 2 shows a general positive trend overall, both prior to, as well as subsequent to, the conviction event date. The overall CAR on the event date (t0) is 0.91%, which indicates an overall positive market reaction, contributing to the theory that the market might price in the risk of the potential fine at initiation date. The overall positive trend can also be indicative of the imposed fines not being substantial enough, and/or the share prices of the various companies responding positively to the certainty provided by the conviction.

The general trend amongst the industries is also positive, except for the Oil and Gas industry, which is fully represented by Sasol in this study. A negative CAR for Sasol is reflected approximately five to 12 days after the event date, with an identified trough of -3.48%. This may be the effect of a slow market reaction to the event and the overall magnitude of the quantum of the fine, (in excess of R4.5 billion). During the latter part of the subsequent trading month the overall gain across all the companies is around 3% by day t+22.



Source: JSE Bulletin Database

Figure 3: Cumulative abnormal returns around the announcement date of the payment of the fine by the convicted company

Figure 3 shows the general trend of the combined CAR around the payment date to be neutral. It can however be determined that there is a slight positive market trend prior to the event date, but thereafter the overall trend remains flat. On the event date, all the industries reflect a positive CAR, the only exception being Oil and Gas, which shows a CAR of -0.54% on the day of the event, and reaches a trough on day t+13 post the event with CARs at -4.36%. The Telecommunications industry follows a similar pattern, and reflects a CAR of about -10% on day t+17. The impact of the actual event on these negative cumulative abnormal returns is perhaps questionable, due to the fact that the impact follows the event date by approximately three weeks. It is possible these are unrelated confounding events.

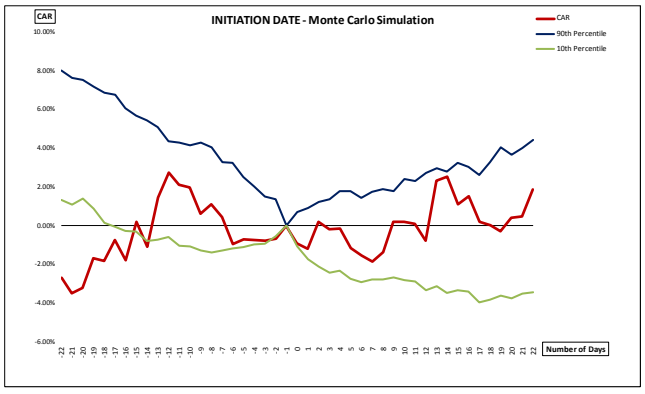
It might be argued that the apparent delayed reactions and troughs could be a result of an inefficient market, as the news of the final value spreads through the shareholders; or that there might be a slight difference between the actual event date and the corresponding date published in the media. Reflecting on the overall results, the only clear impact recorded occurs on the conviction date and over the period

surrounding this date. The CARs on the initiation and payment dates have a neutral trend.

There are, however, no clear peaks or troughs on the actual event dates (t0), and therefore an inference can be made that the market does not necessarily react in a positive or negative way on the imposition of regulatory fines. The pre-event and post-event trends, however, illustrate that the market might anticipate the investigation, conviction and payment of the regulatory fines. It therefore can be inferred that the market prices in the risk of investing in these industries when the shares are initially purchased.

To determine if the combined CARs were of statistical significance, we applied a Monte Carlo simulation (MCS) to each of the three event stages. Using data just prior to the event window, we selected 100 random dates for each company and estimated the CARs over the (random) events to construct a boot-strap distribution. The top 10% (90th percentile) and lowest 10% (10th percentile) of the boot-strap distribution were plotted against the actual results to establish if there were any points on the combined CARs which exceeded the 90th or 10th percentile. These points can then be viewed as significant in relation to the current research.

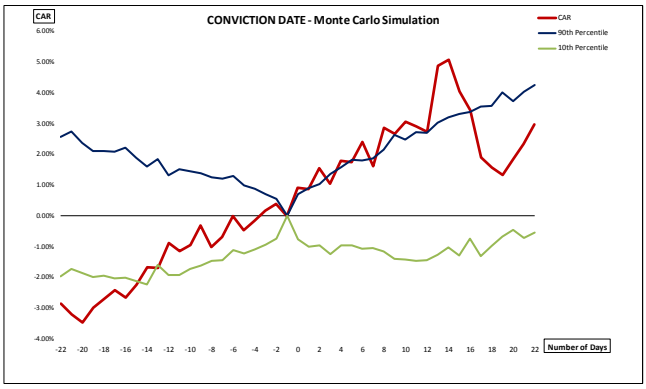
Figure 4 reveals the results of the MCS at the initiation date of the regulatory fine process. Approximately 14 trading days prior to the event it can be noticed that the combined CARs enter into the band of the 90th and 10th percentile, a statistically significant negative position. The combined CARs remained within this band through the event date as well as the subsequent trading month, revealing no significant impact on shareholder returns from t-13.



Source: JSE Bulletin Database

Figure 4: Monte Carlo simulation results of cumulative abnormal returns for the initiation event window

The MCS for the conviction date, as plotted in Figure 5, reveals that the positive trend experienced by the combined CARs prior to the conviction date are significantly negative from t-22 to t-25. After the event, from t0 to t+15, the actual CARs follow (and generally exceed) the 90th percentile of the boot-strapped distribution, suggesting that these are significantly positive and not random.

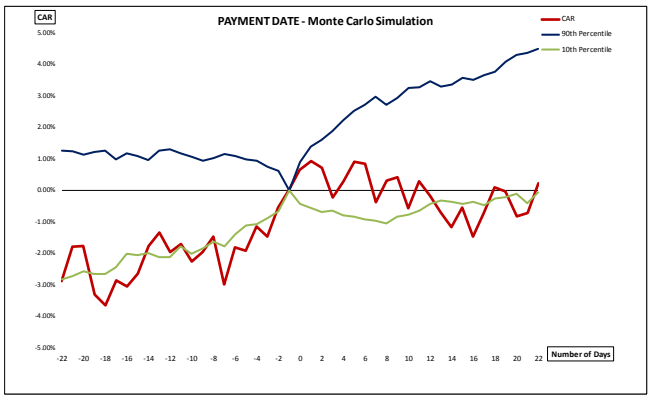


Source: JSE Bulletin Database

Figure 5: Monte Carlo simulation results of cumulative abnormal returns for the conviction event window

This finding may add to the argument that the imposed fines were lower than expected.

The MCS prior to the payment date (Figure 6) reveal significantly negative CARs (generally below 10th percentile band), indicating that the market returns were cumulatively higher than expected prior to the event. After the event the CARs are within the bands, but fall below the 10th percentile after t+12.



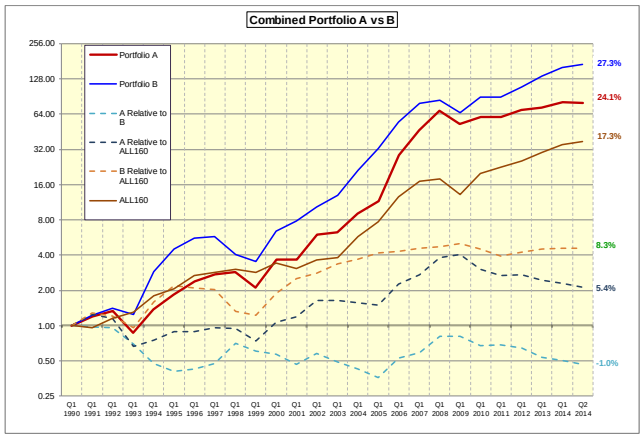
Source: JSE Bulletin Database

Figure 6: Monte Carlo simulation results of cumulative abnormal returns for the payment event window

Buy and hold portfolio analysis

As stated earlier, an analysis was conducted to establish the growth between two investment portfolios over a period of time. Portfolio A comprises the companies which have been subject to regulatory fines, whilst portfolio B comprises the paired companies (see Table 1) which had never been fined.

The analysis was done over a period of 24 years, commencing during the first quarter of 1990. Companies were included in their respective portfolios as soon as they were listed (if not listed in 1990). Table 1 (above) details the year in which the convicted companies in the sample were listed on the JSE. We also include a benchmark portfolio, being the top 160 shares (ALL160) on the JSE (the equal-weighted ALSI) and provides an overall measure of portfolio performance.



Source: McGregor BFA (2014)
Index Analysis: Chris Muller & Mike Ward (2014)

Figure 7: Buy and hold performance for fined companies (portfolio A) versus paired non-fined companies (portfolio B)

Figure 7 reflects the performance of portfolio A (all of the companies included in the sample and fined by a regulatory body) and portfolio B (companies never fined) relative to each other as well as the equal weighted ALL160.

Over the 24 year period it is evident that portfolio B outperformed portfolio A by an annualised 3.2%, whilst both portfolios outperformed the ALL160.

Conclusions

The first aim of the research was to establish if regulatory fines have an identifiable and substantial immediate impact on shareholder returns. The fines originated as a result of collusive or cartel-like behaviour, and were imposed by regulatory bodies on JSE listed companies.

The second objective of the research was to establish if regulatory fines have a long term effect on the returns of the sample companies. This was done through the formation of a portfolio of convicted companies, which was compared to the equal weighted all share index (ALL160) and a portfolio of paired companies which had not been fined.

The research sample covered five industries, 12 companies, 23 events and 69 sub-events, (the initiation, conviction and payment stages of the process). The event studies included relevant data for each of the sub-events and covered a period of one trading month pre and post the event date.

Rotemberg and Saloner (1986) show that collusion is most likely to occur in industries where there is unusually large demand. Our findings support this, as more than 80% of the value of the fines issued in the sample relate to the construction industry and the oil and gas industry, both of which experienced strong cyclical demand over the timeframe. Furthermore, Rojas (2012) concluded that collusion is most likely in environments in which competitor demand is described as “most certain”, an attribute related to the construction industry.

Our event study results revealed that industries, in general, vary in the way they react at the various stages of the process. The within-industry sample sizes were too small to generalise any obvious conclusions. The combined CARs however, returned the following results at the various stages.

At the initiation stage, the combined CARs reflected a neutral result prior to, and post the announcement of an investigation into collusion. This was a surprising result, and differed from expectation and the findings of Cloninger and Waller (2000) and Aguzzoni *et al.* (2013), who showed that the ARs dropped into negative territory when collusion is detected (although for some industries we did find evidence of this). We assume that in the South African environment, investors anticipated the investigations.

At the conviction stage, an overall positive combined CAR for the sample both prior to and after the event was evident, contradicting the findings of Cloninger and Waller (2000) and Aguzzoni *et al.* (2013). Once again this was an unexpected result and it can be inferred that the market was relieved with the result of the conviction. This relief might be due to the fact that the quantum of the fine was less than expected, or possibly this was a reflection that certainly around the matter was now established.

The event analysis around the payment date reflected a significant positive trend in the combined CARs prior to the event, and a flat trend during the subsequent trading month. Currell and Davis Bradley (2012) contend that companies convicted of collusive behaviour also have to contend with subsequent costs, so once again, this may signal the relief of the market at the conclusion of the episode.

The results of the longitudinal study (Figure 7) tracked the buy-and-hold performance of the convicted sample (portfolio A) of companies against paired companies which had not been fined (portfolio B) and the equal weighted benchmark of the top 160 companies over a period of 24 years. The overall growth of portfolio A was 24.2% pa; portfolio B was 27.3% pa and the ALL160 was at 17.3% pa. From these results we observe that the sectors which included the sample companies out-performed the ALL160 benchmark by about 8% pa. However, since portfolio B (non-fined companies) out-performed portfolio A (fined companies) we would conclude that collusion (after being fined) did not pay-off in the long run, adding support to the findings of Lean *et al.* (1985) and Aguzzoni *et al.* (2013), who concluded that fines are necessary to break down collusion and remove the profit incentive. In contrast to Combe and Monnier (2011), we find no evidence of over-regulation.

It must, however, be noted that the size of the sample was relatively small and that the study should be repeated in a few years, when the sample size has increased, to reaffirm the findings.

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Appendix 1 – Details of the events analysed

Aveng Group Limited

Aveng Group Limited (Aveng) was fined during 2009 as a result of collusive behaviour by its business unit Infraset, related to concrete products (culverts and pipes) manufactured by the unit. The value of the fine was R46.3 million which equates to 8% of Infraset's turnover for the period ("Aveng fined R46m for collusion," 2009).

The commission initiated an investigation into the alleged cartel activity on 19 March 2008 (the initiation date). The consent order was passed on 25 February 2009 (the conviction date), with the payment split between three equal sums, the first being no more than 30 days from the conviction date (the payment date) and the remaining two on 28 February 2010 and 2011 respectively ("Competition Commission and Aveng. Case No 24/CR/Feb09," 2009).

In addition to the afore-mentioned conviction and fine, Aveng was also investigated and convicted on various historical anti-

competitive practices, some related to the SWC 2010, in which various other construction companies suffered a similar fate ("Aveng reaches R306m settlement with Competition Commission," 2013). The value of the fine was approximately R306.6 million and payable in three instalments.

The commission initiated the investigation into the alleged collusive practices in the construction industry on 10 February 2009 (the initiation date). The tribunal passed the consent order on 21 June 2013 (the conviction date) and the payment terms consisted of three equal instalments, the first of which was payable on 1 July 2013 or within 30 days from the consent date (the payment date). The second and third instalments are due on 1 July 2014 and 1 July 2015 respectively ("Competition Commission and Aveng. Case No 016931," 2013).

The third event identified by the researcher, involved the fining of Aveng by the commission for its involvement in cartel-like behaviour in the wire mesh and reinforcing steel rebar business. Aveng's subsidiary, Steeledale, was implicated in the cartels and a fine of R128.9 million was imposed during 2011 ("Aveng to pay R128,9m collusion fine," 2011). The fine was equal to 8% of Steeledale's turnover for the 2008 financial year.

The complaint was initiated on 26 January 2009 by the commission (the initiation date), with the consent order passed by the tribunal on 6 April 2011 (the conviction date). The payment of the fine was to be in four equal instalments over a 24-month period. The first payment had to be made within seven days of the consent order (the payment date), with the final three instalments payable within eight-month intervals ("Competition Commission and Aveng. Case No 84/CR/Dec09 and 08/CR/Feb11," 2011).

The final event identified by the researcher involves Duraset, a subsidiary of Aveng. The event commenced through an investigation by the commission into an alleged mining roof bolt cartel on 8 September 2008 (the initiation date). After the investigation Duraset pleaded guilty to collusive tendering for mining roof bolts and the consent order was passed by the tribunal on 25 August 2010 (the conviction date). The fine was set at R21.9 million and constituted 5% of Duraset's turnover for 2008 ("Competition Commission and Aveng. Case No 65/CR/Sep09," 2010). The payment date was set to 90 days after the date of the order, placing it around the mid to end of November 2010.

Basil Read Holdings Limited

Similar to Aveng's second event, Basil Read Holdings Limited (BR) was part of the group of companies investigated by the commission for collusion related to the SWC 2010 infrastructure. BR was fined approximately R95 million by the tribunal when convicted (Maboja, 2013).

The initiation date of the investigation was 10 February 2009. The conviction date can be viewed as 22 July 2013, the date the consent order was issued by the tribunal. The payment of the fine was agreed to be in two equal portions of approximately R47.5 million, with the first payable 30 days after the order date, and the second 12 months after the first payment ("Competition Commission and Basil Read. Case No 016949," 2013).

Esor Limited

Esorfranki (Esor) formed part of the group of companies investigated by the commission on allegations of collusion related to the construction of infrastructure pertaining to the SWC 2010. The company was handed the smallest of the fines imposed by the tribunal on the convicted companies, and was only liable to pay R115 850, which is substantially lower than the other convicted companies (Venter, 2013). Esor was only found guilty on one matter, which explains the lesser fine.

The initiation date of the investigation was 10 February 2009 with the consent order passed by the tribunal on 22 July 2013 (the conviction date). The payment terms reflected full and final settlement within 30 days from the consent order, 22 August 2013 (the payment date) ("Competition Commission and Esorfranki. Case No 016956," 2013).

Murray and Roberts Holdings Limited

During 2013 Murray and Roberts Holdings Limited (MR) agreed to pay a R309 million fine as a result of bid rigging. MR formed part of the group of construction companies which was fined collectively in excess of R1.46 billion as a result of market collusion related to contracts awarded for infrastructure and stadium construction for the SWC 2010 (Allix, 2013b).

The initiation date of the investigation was 10 February 2009, with the tribunal issuing the consent order on 22 July 2013 (the conviction date). The payment of the fine was split into three instalments with the first being 30 days after the consent order issuance (the payment date), the second and third payments are to be made 12 months after the first and second payment respectively ("The Competition Commission and Murray & Roberts Li. Case No 017277," 2013).

Pioneer Food Group Limited

During the first quarter of 2010 Pioneer Food Group Limited (PFG) was fined by the tribunal for its role in a bread cartel through its subsidiary Sasko. This cartel included other companies like Tiger Brands, Premier and Food Corp, and focussed mainly on the Western Cape ("Pioneer Foods fined R195m for cartel role," 2010). After the fine was imposed, the tribunal stated that this was the maximum penalty it was entitled to levy for the offence, which was approximately 10% of Sasko's turnover in the Western Cape and national. The total amount of the fine was approximately R195.7 million.

The complaint was initiated by the commission during December 2006 (the initiation date), the consent order was issued on 3 February 2010 (the conviction date), with payment following 20 business days after the order (the payment date) ("Commission and Pioneer. Case No 15/CR/Feb07," 2010). Due to the fact that PFG only listed on the JSE during 2008, the initiation date will be listed as an event, but will not form part of the analysis and the event study model. No share data was available in 2006 and therefore the inclusion of the event in the model will not produce accurate results.

During the same year, PFG was fined R500 million for its part in anti-competitive and cartel-like behaviour in the maize milling industry. The commission originally sought a fine to the amount of R3.2 billion or 10% of Pioneer's 2009 turnover, but the tribunal reduced this fine after negotiations with the company ("Pioneer slapped with R500m in fines," 2010). The fine would be payable in three instalments.

The initiation date of the investigation was 14 March 2007, with the consent order being passed on 30 November 2010 (the conviction date). The payments were to be made in three instalments, with the first being 5 days after the order date (the payment date) to the value of R66.6 million; the remaining two instalments were to be settled in two equal values of R216.6 million, 12 months and 24 months respectively, after the conviction date ("Competition Commission and Pioneer (Consent Order). Case No 15/CR/Mar10," 2010). Similar to the first event, the initiation date was prior to the listing of PFG on the JSE, and therefore the same criterion applies as per the previous PFG event.

Raubex Group Limited

Raubex Group Limited (Raubex) was part of the group of construction companies investigated and convicted by the commission and tribunal as a result of anti-competitive behaviour relating to the construction of several infrastructure projects related to the SWC 2010 ("Construction companies fined R1.5-bn," 2013). The value of the imposed fine was R58.8 million.

The initiation date of the investigation by the commission was 10 February 2009, with the consent order issued by the tribunal on 22 July 2013 (the conviction date). The payment date was 30 days after the conviction date, around 22 August 2013 ("Competition Commission and Raubex. Case No 017012," 2013).

Rand Merchant Bank, a division of First Rand Bank Limited

The commission initiated a complaint against Rand Merchant Bank (RMB) during October 2008 following allegations of price fixing and fixing of trading conditions in the grain market. It was found that RMB and NWK entered into a vertical agreement regarding the storage and sale of grain, which divided markets and allocated territories. The tribunal issued the consent order on 14 July 2011 (the conviction date) to the value of R2.1 million or 3% of the value of the grain affected ("Competition Commission and Rand Merchant Bank. Case No 44/CR/Jun11," 2011). The payment date was agreed to be 60 days after the issuance of the consent order by the tribunal.

Sasol Limited

During the first half of 2009 Sasol Nitro, a division of Sasol Chemical Industries, was fined approximately R251 million for collusive conduct with two other companies ("Tribunal confirms R251-million fine for Sasol," 2009). The original agreement between the parties proposed a fine of R188 million, but this was increased after various other disclosures were made by Sasol.

The complaint was referred to the commission by a third party on 3 November 2003 (the initiation date), with the tribunal issuing the consent order on 20 May 2005 (the conviction date). Full and final settlement of the fine was to happen 60 days after consent order (the payment date) ("Commission and Sasol. Case No 31/CR/May05," 2009).

The second event identified by the researcher confirmed that Sasol was fined in excess of R111 million for anti-competitive behaviour in its Polymers unit during the first quarter of 2011. It has been reported that a supply agreement between Polymers and another firm, Safripol, resulted in indirect price fixing. The fine constitutes 3% of Sasol Polymers' 2009 turnover ("Sasol slapped with another huge fine," 2010).

During October 2007 the Department of Trade and Industry (DTI) requested the commission to open an investigation into the polymers industry. After a preliminary analysis the commission initiated an investigation on 12 November 2007 (the initiation date). The consent order was issued by the tribunal on 24 February 2011 (the conviction date), with the payment date being 60 days from the consent order ("Competition Commission and Sasol. Case No 48/CR/Aug10," 2011).

The third event involving Sasol occurred during 2014 when the tribunal imposed a fine of R534 million on Sasol for excessive pricing of local customers for propylene and polypropylene, key ingredients in plastic products (Crotty, 2014). The tribunal also ruled that Sasol must sell these products at the same factory price to all customers.

The initiation date can be established as August 2007 when the DTI lodged a complaint with the commission. The order was issued on 5 June 2014 (the conviction date), with payment expected 90 days after the order (the payment date) ("Competition Commission v Sasol Chemical Industries. Case No 011502," 2014). For the purposes of accurate data analysis, the payment date as established in this event will be noted, but excluded from the event study model, due to the fact that payment will incur on a future determined date, and no data is available at the present moment to provide

substantiation to the test. The "cut-off" date in terms of the current research can be viewed as the first week in June 2014.

The final event involving Sasol, occurred during 2008 when Sasol was amongst nine petrochemical companies fined in excess of €676 million for forming what the European Commission referred to as a "paraffin mafia", after evidence concluded price-fixing and monopoly gain in the wax business (Taylor, 2008). This was the fourth largest fine ever imposed by regulators on a sector, with the largest being €992 million on elevator companies in 2007. Sasol's portion of the fine was €318.2 million (R3.7 billion) which was the largest of all the convicted companies (Taylor, 2008). The fine was paid in full in 2009, but Sasol made a clear indication that it would appeal the fine as it believed the liability to be excessive (Pickworth, 2014). This appeal gained success as the European General Court reduced the fine to only €149.98 million on 11 July 2014.

For the purposes of the current research, the initiation date can be established as April 2005 ("Antitrust: Commission fines wax producers 676 million euros for price fixing and market sharing cartel," 2008), with the conviction date set as 1 October 2008. The payment date can be viewed as January 2009 ("Positive Actions. Annual review and summarised financial information 2009," 2009).

Stefanutti Stocks Holdings Limited

Stefanutti Stocks Holdings Limited (Stefanutti) was one of the companies convicted and fined by the commission for collusive behaviour as a result of contracts related to the SWC 2010. The total fine to the companies equalled R1.46 billion, with Stefanutti' s portion being approximately R307 million. The fine was imposed during 2013 (Allix, 2013a).

The initiation date of the investigation was 10 February 2009, with the consent order issued by the tribunal on 22 July 2013 (the conviction date). The payment of the fine was split into four sections, with the first payment of R69 million to be made within 30 days of the order date (the payment date). The second and third payments, equalling R69 million each, were to be made 12 months after the first and second payment respectively. The final payment of R110 million, which includes 10% interest, will be paid 12 months after the third payment, releasing Stefanutti from the liability only in 2016 ("Competition Commission and Stefanutti Stocks. Case No 017038," 2013).

Another event involving Stefanutti in collusive behaviour was identified by the researcher, where the company was fined approximately R56 million as a result of further tender collusion not disclosed during the fast track process initiated by the commission during 2013 (Allix, 2013a). This event had specific reference to the tenders submitted for the Durban Undersea Tunnel project.

The commission initiated an investigation into the alleged collusive behaviour on 22 July 2009 (the initiation date). The consent order was passed by the tribunal on 1 August 2013 (the conviction date), with payments split into four portions. The first payment of R12.55 million was to be made within 30 days of the consent order (the payment date), the second payment of similar value on the anniversary of the first payment, the third payment of R12.56 million 12 months after the second payment, and the fourth and final payment of R20.02 million (including 10% interest) to be made on the anniversary of the third payment ("The Competition Commission and Stefanutti Stocks. Case No 017525," 2013).

Telkom SA Limited

During 2012 Telkom SA Limited (Telkom) was handed an order by the tribunal to pay a fine as a result of abusing its dominance in the market and making its downstream competitors less competitive during the period from 1999 to 2004. This fine was to the value of R449 million and constituted 5% of the company's then market capitalisation of R9 billion, or two-and-a-half times its operating profit during the financial year ending 31 March 2012 ("Telkom agrees to pay R449m fine for 'abusing its dominance,'" 2013).

Although this conviction was not as a result of collusive behaviour, it is relevant to the current research as it displayed anti-competitive behaviour which adversely influences the market. The initiation date of the investigation was 24 February 2004, with the consent order issued by the tribunal on 7 August 2012 (the conviction date), the payment was split into two 50% portions with the first being six months after the order, 7 February 2013 (the payment date) and the balance 18 months after the order date on 7 February 2014 ("Competition Commission and Telkom SA Ltd. Case No 11/CR/Feb04 (003855)," 2012).

The second event identified by the researcher refers to the fine imposed on Telkom by the tribunal for similar practices as identified in the afore-mentioned event, but this time focused on the internet market during 2005 to 2007. The value of the fine was R200 million and was imposed upon the company during the third quarter of 2013 (Odendaal, 2013).

The matter was brought before the tribunal on 26 October 2009 (the initiation date), with the consent order issued on 18 July 2013 (the conviction date). The payment was split in three evenly sized portions, of which the first would occur on or before 18 August 2013 (the payment date), the second payment would be no later than 12 months after the conviction date, with the third being 12 months after the second ("Competition Commission and Telkom. Case No 016865," 2013).

Tiger Brands Limited

Following complaints during December 2006 by bread distributors in the Western Cape regarding alleged bread and milling cartels, an investigation was undertaken by the commission, and Tiger Brands Limited (TBS) was found guilty of price fixing in the bread industry, along with Premier

Foods and Pioneer Foods ("Tiger Brands slapped with R98m cartel fine," 2007).

The commission initiated the complaint during December 2006 (the initiation date), served the consent order on TBS on 9 November 2007 (the conviction date) after which TBL committed to payment within 30 days (the payment date) ("Commission and Tiger Brands. Case No 15/CR/Feb07," 2007). TBS was fined approximately R98 million or 5.7% of its national bread turnover for 2006 ("Tiger Brands slapped with R98m cartel fine," 2007).

The second event investigated under TBS involved the fining of one of its subsidiaries, Adcock Ingram Critical Care (Pty) Ltd (AICC). During 2005 the commission undertook an investigation into the alleged collusive tendering and division of the private hospital market by AICC ("Competition Commission and Adcock Ingram. Case No 20/CR/Feb08," 2008). The case was referred to the tribunal on 11 February 2008 after which the terms and conditions of the consent agreement was discussed with TBL as the holding company.

The consent order was signed by all parties on 9 May 2008. AICC confirmed that it would pay the fine of R53.5 million, 8% of its 2007 turnover, within 30 days of the order ("Tribunal confirms Adcock fine," 2008). The dates for the purpose of the research, to establish if the fine had an impact on the shareholder returns of TBS, the holding company, are 11 February 2008 (tribunal initiation date), 09 May 2008 (conviction date) and the days surrounding 09 June 2008 (payment date).

WBHO Limited

WBHO Limited was fined approximately R311 million by the commission as part of a large scale investigation into collusive tendering, as a result of contracts related to the SWC 2010 (Clark, 2013). The fine constituted 3.9% of turnover and was the largest fine imposed by the tribunal of all the convicted construction companies for similar offences during the same period.

The investigation by the commission into alleged collusive practices as a result of SWC 2010 contracts was initiated on 10 February 2009 (the initiation date). The consent agreement was concluded on 24 June 2013 (the conviction date), with payment following in three equal instalments - the first being 30 days after the consent agreement (the payment date), the second 12 months after the first, and the third 12 months after the second ("Competition Commission and WBHO Construction. Case No 017061," 2013).

Identified as a second event for the purpose of the current research, WBHO was fined R10.2 million by the commission - 0.3% of its civil engineering sub-sector turnover for 2010 - after admitting to collusive tendering on the Sishen-Saldanha (SS) railway project (Slabbert, 2014). The collusion amongst WBHO and other construction companies occurred during November 2006, after eight companies were invited by Transnet to tender on earthworks, track laying and overhead traction equipment on the SS project (Cokayne, 2014).

The commission initiated an investigation into the alleged collusive tendering practices by WBHO and various other companies on 16 July 2009 (the initiation date), the consent order was issued by the tribunal on 9 April 2014 (the conviction date) and payment was due within 30 days from this order (the payment date) ("Competition Commission and WBHO Construction (Pty). Case No 18549," 2014).