

Not all Gold Shines in Crisis Times - COVID-19 Evidence

Dirk G. Baur* and Allan Trench

The University of Western Australia

August 2020

Abstract

This paper analyses the impact of the coronavirus pandemic on the share prices of gold firms, whose activities are spread across gold exploration, project development and gold mining with markedly different risk characteristics. We find evidence for COVID-induced stock market contagion leading to a decoupling of gold companies from the price of gold illustrating that gold shares are not a safe haven. The equity market and gold exposures differ significantly between explorers, developers and producers in normal times and are higher and more similar in crisis times. Our findings demonstrate that investors treat different firms differently in normal times and more equally in crisis times leading to mispricing and profit opportunities.

Keywords: gold, gold shares, safe haven, COVID-19, crises, contagion

*Corresponding author. Address: UWA Business School, The University of Western Australia, 35 Stirling Highway, CRAWLEY WA 6009, Australia. Email: dirk.baur@uwa.edu.au

1 Introduction

Interest in gold and in gold equities as a potential safe haven investment has heightened during the COVID-19 period.¹ For gold itself, in Australia, the combination of a strong US-dollar gold price with a relatively weak Australian dollar (A\$) resulted in record A\$ gold prices in nominal terms. For gold equities, the situation is more complex. Gold equities are not commodities, as the business activities and assets of each firm differ from the next. Gold equities encompass explorers (approx. A\$10m to A\$100m capitalisation), developers (approx. A\$100m to A\$1 billion) and miners (approx. A\$1 billion to A\$10 billion). The prevailing investment thesis is that gold equities are leveraged to gold price strength and weakness. Put simply, if the price of gold goes up, gold company share prices will go up and if the price of goes down, gold company share prices will go down. But is the actual linkage between gold and gold equities really that simple or are there other factors that can lead to a more complex relationship? More specifically, are gold equities as immune to market shocks as physical gold?

The COVID-19 market shock provides a unique time-bound opportunity to unpick the assumed leverage of gold companies to the gold price and assess their level of market immunity. That is, gold companies, unlike gold bullion, are also linked to the broader equity market. Whilst this market exposure may be not too obvious or hidden in normal times, it is very prominent in crisis times, e.g. during the current COVID-19 pandemic.

This paper uses the COVID-19 shock to study the links of gold companies to gold and to the market in normal times and during the COVID-19 crisis time. We study different types of companies with different exposures to the market and to gold and the role of the gold price in A\$ and in US\$.

¹Warren Buffett's Berkshire Hathaway recently announced holding a \$500m stake in gold mining company Barrick Gold ("Warren Buffett's Berkshire Hathaway Joins the Gold Rush", Wall Street Journal, August 17, 2020).

The econometric analysis uncovers the following relationships: gold firms are differently exposed to the market and the gold price in normal times (producers more to gold and less to the market and explorers less to gold and more to the market consistent with the higher risk of these companies) but much more exposed and more similarly exposed during the pandemic. The “normal” or pre-COVID betas based on gold prices in A\$ are generally larger than the betas based on gold prices in US\$.

The results indicate that investors distinguish between explorers, developers and producers in normal times but less so in crisis times. In crisis times, the market dominates, not because the exposure (beta) is much larger but because the magnitude of the market shock is much larger (e.g. -20%) than the magnitude of the gold shock (e.g. +5%). As a consequence, gold equities were far from immune to the COVID-19 market shock.

The decoupling of gold shares from the price of gold is bad news for gold mining companies and shows that the market exposure can be contagious if the shock is too large. The decoupling of gold shares from the price of gold also means that there is an expected recoupling to realign valuations with the price of gold in the future. The contagious impact of the market on all different types of gold shares is bad news for investors because diversification did not work when needed the most.

The literature on gold mining shares dates back to Faff and Chan (1998), Twite (2002), Baur (2011), Baur (2014) and, more recently Jensen, Johnson, and Washer (2018). The closest research to this paper is a study by Baur, Prange, and Schweikert (2020) who analyze the performance of the largest gold shares traded on the Australian, Canadian, UK and US stock markets for major economic and financial crisis but excluding the COVID-19 crisis and not distinguishing between types of gold firms, i.e. between explorers, developers and miners.²

²Global trends in gold mining are analyzed in Mudd (2007a), Mudd (2007b).

The paper also contributes to the literature on the role of gold as a currency hedge (e.g. see Capie, Mills, and Wood (2005), Reboredo (2013), Reboredo and Rivera-Castro (2014)), as a safe haven (Baur and Lucey (2010), Baur and McDermott (2010)) and to gold mining in general (e.g. Tufano (1996), Tufano (1998), Adam, Fernando, and Salas (2017))

We contribute to the literature on financial contagion with a granular analysis of the reactions of gold companies with different business models to the COVID-19 pandemic. That is, our analysis separates gold explorers from gold developers and from gold miners. We also study the performance of gold in US\$ and in A\$ and thereby highlight the ability of gold to hedge currency risk.

The rest of the paper is structured as follows. Section 2 describes the types of gold firms and the data. Section 3 presents the empirical analysis based on a panel model. Section 4 summarizes the main findings and concludes.

2 Data and Descriptive Analysis

Data

We identify 230 ASX-listed companies across the value chain where the principal business focus is gold. The companies were classified by their business activity as gold miners (33 companies), gold project developers (25 companies) or gold explorers (171 companies). The list of firms (company names) and their market capitalization as of December 2019 is presented in Tables 4 - 6 in the Appendix.

Gold mining companies are defined as having already commenced gold production from one or more operating mines.

Gold project development companies are defined as having already delineated significant in-ground gold resources but who have yet to commence gold production.

That is, project development companies are undertaking a stage-gated evaluation process to evaluate the economics of future gold production. No distinction was drawn as to the relative stage of project assessment - early-stage (e.g. scoping level study), mid-stage (e.g. feasibility studies) or late-stage (e.g. Final Investment Decision and construction).

Gold exploration companies comprise those companies holding exploration licences and with clear intent to discover and delineate gold deposits. No distinction was drawn as to the relative stage of gold exploration - early-stage (e.g. licence application and remote targeting), mid-stage (e.g. field-sampling and active drill-testing) or late-stage (e.g. discovery and delineation of gold resources).

We consider this three-fold classification to be insightful, but unlike gold, gold equities themselves are not standardised in their composition. Indeed, no two gold companies are exactly the same.

ASX-listed gold mining companies may operate in Australia (e.g. Pantoro, Ramelius Resources, Regis Resources) or also own gold mines internationally (e.g. Northern Star Resources, St Barbara Mines). Gold mines can be open pit, underground operations or developed as a combination of the two. The grade of gold that is mined can vary tenfold, for example from less than 1 gram per tonne to over 10 grams per tonne of gold (Ulrich, Trench, and Hagemann (2019)). Gold mining companies also have different balance sheets, capital costs, operating costs (All-In-Sustaining-Costs, AISC, Gianfrate (2017)), currency exposure, production scale (Guj (2011)), hedge books (Tufano (1998), Fang, Chien-Ting, and Poon (2007)), in-ground reserves or resources (Ulrich et al. (2019)) and vastly different environmental footprints (including Greenhouse Gas Emissions, Mudd (2007a), Ulrich, Trench, and Hagemann (2020)).

Similarly, gold project development companies may be Australian (e.g. Bellevue Gold, Western Australia) or internationally-focused (e.g. Big River Gold, Brazil;

Geopacific Resources, Papua New Guinea), hold gold projects with varying capital requirements, forecast costs, lead-times, socioeconomic impacts and production scale (Ferguson, Clinch, and Kean (2011)). Furthermore, some gold assets contain just gold, whereas others have payable co-products (e.g. gold and copper) or by-product credits (e.g. silver).

Gold exploration companies too are non-standardised (e.g. Kreuzer, Etheridge, and Guj (2007)). We highlight the different stages of gold exploration above, the degree to which gold explorers have discovered in-ground gold as either resources or reserves, but many other differences also exist between exploration companies. For example, explorers may be active in one or more jurisdictions (e.g. Arrow Minerals in Burkina Faso & Australia), with some geographies ranked as more risky than others (Stedma, Yunis, and Aliakbar (2019)). Some explorers are solely gold-focused, whereas other explorers hold leases that are prospective for both gold and for other commodities (e.g. for gold, nickel and lithium in the Western Australian goldfields). Gold explorers also differ in their level of cash reserves and in enterprise values. Finally, gold exploration assets may be either wholly-owned by a single company, or else explored under joint venture agreements with one or more partner companies (e.g. Guj (2011), Guj, Fallon, McCuaig, and Fagan (2011), Ulrich et al. (2020)).

Descriptive Analysis

Figure 1 shows the relative market performance of the different types of gold companies to the gold price and ASX100 in the years leading up to the COVID-19 pandemic. Since 2017, the average performance of gold producers materially outperformed gold developers, who in turn outperformed gold explorers. That is, despite the strong performance of the gold price, rising over the period, the market support for the different types of gold companies decoupled. Gold producers, earning

cashflows from mining, performed best, but still underperformed gold itself. Gold developers had no such cashflow buffer, and were thus reliant upon sourcing project debt and new equity (at lower prices) in their pursuit of new production. Finally gold explorers were particularly hard-hit in the pre-COVID period, on average falling by over 50%, despite a rising gold market. In the absence of cashflow or asset sales, such companies required ever-lower, diluting, equity raisings to continue exploration for gold.

[Figure 1 about here.]

Figure 2 zooms into the COVID period and presents gold prices denominated in US dollars and Australian dollars. The plots demonstrate why gold is a currency hedge. Since the Australian dollar depreciated relative to the US dollar during the initial phase of the pandemic, the gold price in Australian dollar increased relative to the US dollar price of gold.³

[Figure 2 about here.]

The gold prices in US\$ also show a rather unique pattern for gold at the beginning of a crisis. Whilst gold was relatively stable and did not fall in tandem with the stock market it still fell and appears to have been pulled down by the market. It has been argued that this is evidence that gold lost its safe haven status at the beginning of the crisis. However, it can also be argued that gold was used to cover losses and thus did what is expected of a safe haven asset. The shock from the pandemic was possibly so large that no investor wanted to engage in a flight to gold and buy gold but rather use gold to cover losses or demand a payout of the gold insurance.

³Since gold is traded globally, the relationship of gold prices with the value of currencies is negative. For example, a falling US dollar increases the price of gold in US\$ (all else equal) and a falling Australian dollar increases the price of gold in A\$ (all else equal).

The performance of the various types of gold companies during the pandemic is in marked contrast to the preceding period. Strikingly, the market performance of gold producers, gold developers and gold explorers in the COVID-19 crisis are similar. Decoupling from the gold price is clearly evident, but that decoupling was uniform for each type of gold company unlike in the preceding period of normal market conditions. Put simply, gold companies of all denominations performed in line with the broader ASX 100 market. The exposure of gold companies to the equity market dominated over their linkage to the gold price, whether measured in US\$ (Panel (a) in Figure 2) or in the local A\$ (Panel (b) in Figure 2) .

Since gold prices in A\$ increased by more than gold prices in US\$, the decoupling of gold firms from the prevailing A\$ gold price is larger than from the US\$ gold price as shown in Figure 3. This result may be surprising in that Australian gold producers predominantly own gold mines that are located in Australia, thus the A\$ gold price is the principal driver of their cashflow.⁴

[Figure 3 about here.]

The distribution of firm-specific (unconditional and raw) performances over the full period and in the COVID period is presented graphically through histograms in Figure 4. The histograms illustrate different average returns and distributions across the three types of firms in normal times but similar average returns and distributions in the COVID period.

[Figure 4 about here.]

⁴The results in Table 2 below show that aggregate gold exposure in the initial phase of the COVID pandemic is not higher in A\$ ($0.303 + 0.276 = 0.57$) than in US\$ ($0.222 + 0.349 = 0.57$) but that aggregate market exposure is higher for gold in A\$ ($0.259 + 0.260$) than for gold in US\$ ($0.222 + 0.012$). This is fully consistent with the graph, i.e. the market pull-down is stronger for gold in A\$ than for gold in US\$ resulting in a larger difference for gold in A\$.

3 Econometric Analysis

3.1 Methodology

We use a panel-style model to identify the average exposure of firms to the market and to the price of gold, the different exposures based on the type of gold firm and the different exposures between the pre-COVID-19 “normal” period and the COVID-19 “crisis” period. The model regresses the returns of the gold share prices on the returns of the stock market and the gold price and interacts these variables with dummies for the type of firm (three dummies) and the COVID-19 period (one dummy). The two regressors and the four dummies lead to six regressor variables and an additional 16 interaction terms.⁵

A basic model that includes the gold firm type but does not include the COVID dummy can be written as

$$R_{i,t} = \alpha_i + \beta R_{M,t} \times \mathbf{D}_{\text{firm type}} + \gamma R_{G,t} \times \mathbf{D}_{\text{firm type}} + \varepsilon_{i,t} \quad (1)$$

The parameters β , γ and the dummy variable \mathbf{D} are vectors that allow estimates for each type of gold firm.

A model that does not include the firm type but the COVID dummy can be written as

$$R_{i,t} = \alpha_i + \beta R_{M,t} \times D_{\text{COVID}} + \gamma R_{G,t} \times D_{\text{COVID}} + \varepsilon_{i,t} \quad (2)$$

Finally, the full model that includes both the firm type dummies, the COVID dummy and all interaction terms is written as

⁵The interaction terms are market interacted with 3 firm types and the crisis dummy (4 regressors) plus gold interacted with the 3 firm types and the crisis dummy (4 regressors) plus market interacted with the crisis and the 3 firm types (4 regressors) plus gold interacted with the crisis and the 3 firm types (4 regressors). See also equation 3.

$$\begin{aligned}
R_{i,t} = & \alpha_i + \beta_{0i}R_{M,t} + \beta_{1i}R_{M,t}D_{\text{COVID}} + \\
& + \sum_{j=1}^3 \beta_{2i,j}R_{M,t}D_{\text{firm type},j} + \sum_{j=1}^3 \beta_{3i,j}R_{M,t}D_{\text{firm type},j}D_{\text{COVID}} + \\
& + \gamma_{0i}R_{G,t} + \gamma_{1i}R_{G,t}D_{\text{COVID}} + \\
& + \sum_{j=1}^3 \gamma_{2i,j}R_{G,t}D_{\text{firm type},j} + \sum_{j=1}^3 \gamma_{3i,j}R_{G,t}D_{\text{firm type},j}D_{\text{COVID}} + \varepsilon_{i,t} \quad (3)
\end{aligned}$$

3.2 Estimation Results

This section presents the estimation results based on equations 1 - 3. We first present and discuss the simpler and constrained models based on equations 1 and 2 followed by the unconstrained model based on equation 3.

Table 1 presents the market and gold exposure estimates for all firms and interacted with different types of firms based on equation 1. The market exposure varies slightly across types of firms and is stronger for gold in A\$ than for gold in US\$ for all types especially for gold miners (type 3). The gold exposure increases monotonically from explorers over developers to producers and is, again, stronger for gold in A\$ than for gold in US\$ except for explorers where the exposures are not significantly different from each other.

[Table 1 about here.]

Table 2 displays the exposure estimates on average (in normal times or pre-COVID) and during the COVID-19 pandemic for gold prices in US\$ (Specification 1) and for gold prices in A\$ (Specification 2). The pre-COVID market exposure is similar across specifications (1) and (2) but the gold exposure is larger for gold in A\$ than for gold in US\$. The COVID-specific (abnormal) returns represented by the coefficient estimates for the dummy COVID are significantly negative for both

specifications. The market exposure during COVID is elevated for the specification with gold in A\$ but not for gold in US\$ and the gold exposure during COVID is significantly higher in both specifications but larger for gold in US\$ compensating the lower pre-COVID exposure. In summary, whilst the COVID-specific aggregate gold exposure is similar for both US\$ and A\$ gold prices the market exposure is only elevated for the A\$ gold price specification. This explains the stronger decoupling of gold shares from gold prices in A\$ than from gold prices in US\$ as shown in Figure 3 above.

[Table 2 about here.]

Table 3 present the estimation results of the full model with dummies for the type of firm and for the COVID period and the interactions of these dummies with each other and with the market and the gold returns. The results show that explorers were hardest hit by the COVID crisis based on the excess returns (COVID:type1): the estimates imply an average return of -1% each day during the crisis period. The market exposure increased for all firm types during COVID but more for gold prices in A\$ (Specification 2) particularly for developers and producers. Interestingly, the pre-COVID market exposures based on the type of firm are all insignificant in this model and suggest that the market does not matter much in normal times but has a strong impact in crisis times. This is consistent with the apparent decoupling of gold firms from the price of gold and the market in the pre-COVID period as reported in Figure 1 above.

The interaction terms for the market, the type of firm and the COVID period (market:COVID:type) show that the market exposure increased during the COVID period and more strongly for gold prices in A\$. The interaction terms for gold, the type of firms and the COVID period (gold:COVID:type) show a similar or slightly weaker increase compared to the market exposure changes and explain why the gold firms could not escape the strong pull-down from the market and decoupled from

the gold price as shown in Figures 1 - 3. In other words, because the market fell by more than 20% compared with a much smaller increase of gold, the relatively similar exposure estimates for the market and gold imply that the firms were pulled down by the market and that this move was not compensated by the increased price of gold.

[Table 3 about here.]

3.2.1 Gold firms' market and gold exposures

The analysis in the previous section reports aggregate effects for each type of firm but not individual effects for each firm. In this section we focus on the exposure estimates of each firm and the role of systematic risk across firms.

Figure 5 shows the distribution of market and gold betas for all firms in our sample, split by explorers, developers and producers.

[Figure 5 about here.]

The market betas are generally low and below one for 90% of all firms. The average market exposures are largest for developers (0.37), followed by explorers (0.27) and miners (0.18). The gold betas of the firms reflect their different business activity. That is, the gold producers have higher gold betas (0.76), reflecting their cashflow exposure to the gold price, whereas both developers (0.36) and explorers (0.24) have lower gold betas, consistent with having no direct exposure to cashflow from gold despite their indirect exposure to gold price changes impacting the value of their in-ground, non-producing gold assets. Consistent with the risk of the firms, the histograms also show the greatest dispersion of exposures for explorers and the smallest dispersion of exposures for miners.

Given the low market exposure in “normal” times or on average and the low (well

below one) gold exposure for the majority of firms we expect a small role of systematic risk measured by the market and gold price changes and thus high idiosyncratic risk of firms particularly for explorers and less so for developers and miners. Figure 6 presents the distribution of the role of systematic risk measured by R^2 estimates based on firm-specific time-series regressions. The histograms show that systematic risk plays a minor role for most firms and that all firms are dominated by idiosyncratic risk. Even the relatively large risky gold miners only show an average R^2 of 11% (for gold in A\$) and thus an average idiosyncratic risk of 89%.

[Figure 6 about here.]

Figure 7 further shows that the dominance of idiosyncratic risk in normal times does also apply for the COVID-19 crisis period despite a strong increase in the importance of the systematic risk factors. The strong increase is consistent with the contagious impact of the market as shown above.

[Figure 7 about here.]

4 Summary and Conclusions

This paper is motivated by the COVID-19 induced stock market crash in March 2020 and the role of gold as a safe haven asset. Since gold shares, unlike gold bullion, have an equity component, they are not only linked to gold but also to the market. This link offers interesting insights into investor behavior as a decoupling from the price of gold can be explained with an increasing importance of investor sentiment or uncertainty and be distinguished from fundamentals. Such a distinction is difficult when sentiment and fundamentals decline jointly which is often the case for non-gold shares. Since gold shares have different risk characteristics based on the type of gold

firm, i.e. gold explorer, gold developer or gold miner, we can also analyze whether investors account for the different risks both in normal times and in crisis times.

Our analysis shows that gold firms decoupled from the price of gold during the COVID-19 period because the downward market force was stronger than the gold force consistent with financial contagion. The fact that all types of gold firms fell jointly and by an equal magnitude contributes to the validity of the contagion hypothesis.

The dominant role of the market resulting in a very similar performance of all three types of gold firms suggests that investors treated all firms similarly and did not distinguish between gold firms and other, non-gold firms, and not among gold firms, e.g. between high-risk gold explorers and lower-risk gold miners.

It is interesting that the diversification advice represented by “Don’t put all your eggs in one basket” seems to be reversed in crisis times resulting in market movements that are more similar to “Do put all your eggs in one basket”. It seems that when investor sentiment or uncertainty are extreme, investors treat all firms the same leading to joint, contagious, falls that affect all stocks in the same way.

Since the price of gold and thus the core revenue source of gold firms increased during the crisis, the lower stock valuations suggest an undervaluation of gold firms, particularly gold producers with the most direct link to gold, and a reaction to the COVID-19 shock that is not related to the fundamentals or core revenue stream - gold. This is why gold shares are particularly interesting and why they offer a perspective that is rarely offered by other stocks as it is hard to disentangle changes in fundamentals from changes in market sentiment. In this case, whilst the sentiment has changed the fundamentals with respect to gold have not. If anything, the fundamentals have improved for gold producers given the increased price of gold.

Future research could further investigate the dynamics of mispricing and the time it takes to revert to a fair valuation.

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Appendix

[Table 4 about here.]

[Table 5 about here.]

[Table 6 about here.]

Figure 1: Gold companies' share prices, gold price in US\$ and ASX100

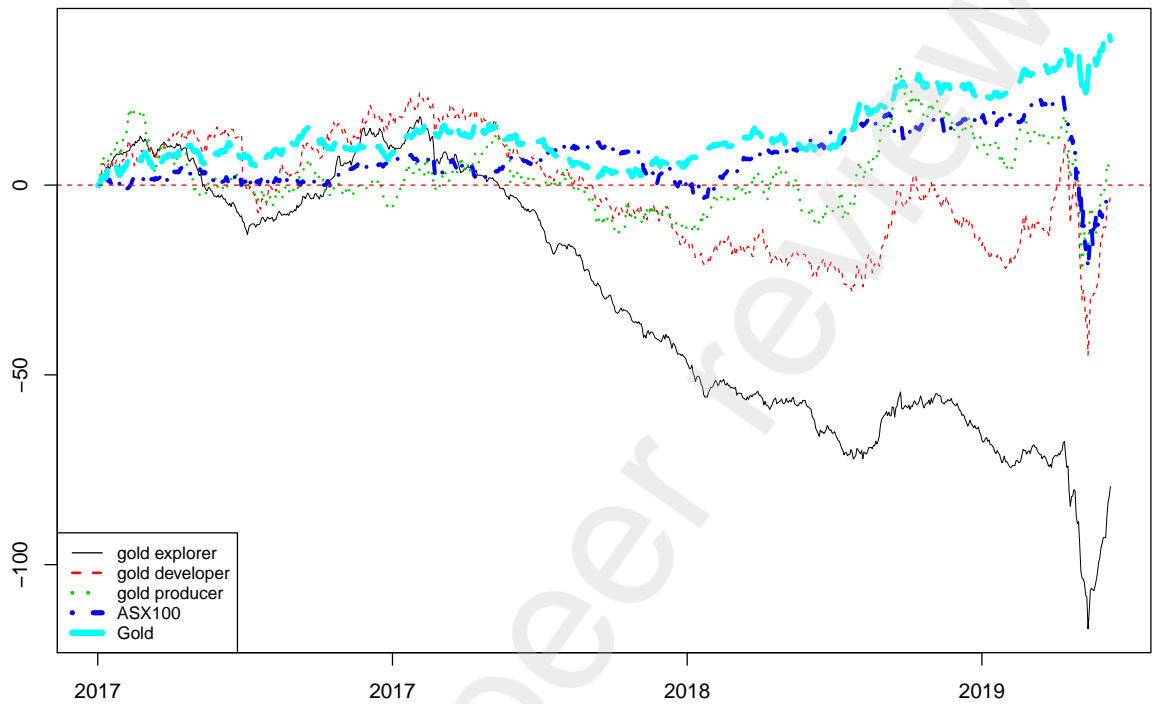
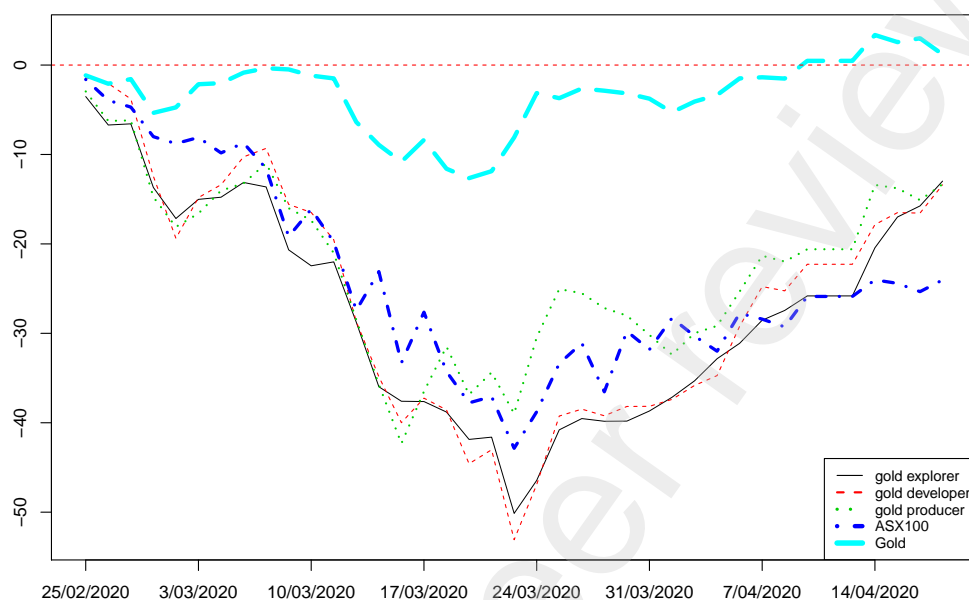


Figure 2: Gold companies' share prices, gold prices in US\$ and A\$ and ASX100

(a) ... gold price in US\$...



(b) ... gold price in A\$...

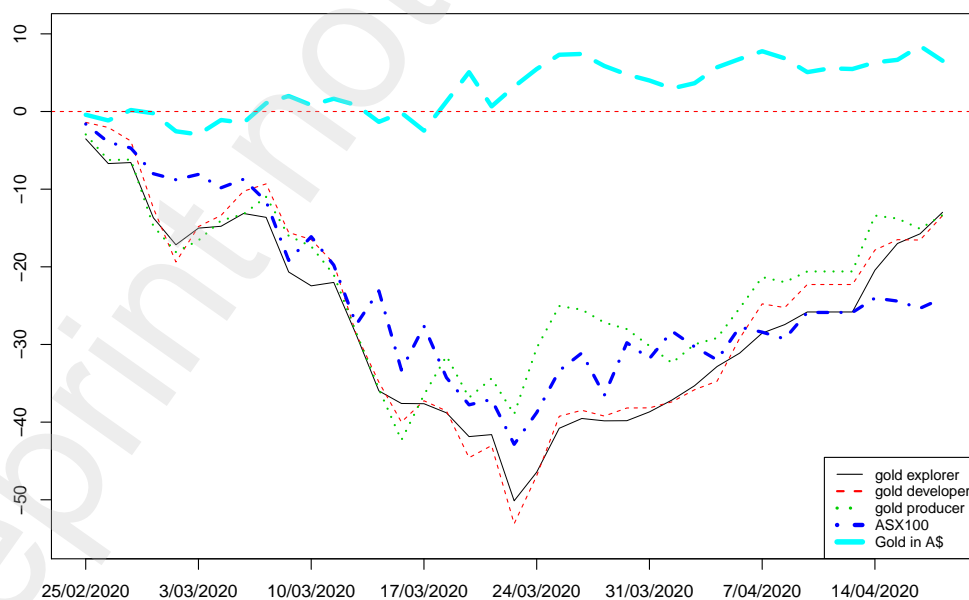


Figure 3: Decoupling - Difference of cumulative average returns of gold companies' shares prices and the price of gold in US\$ and A\$

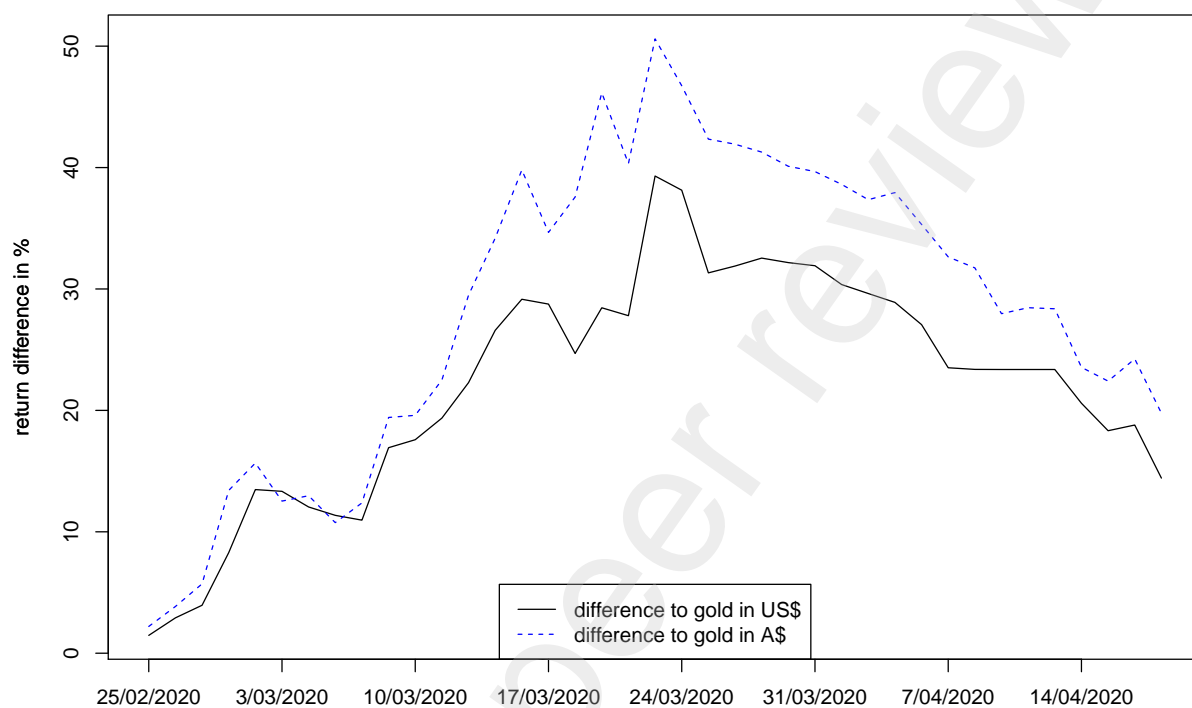
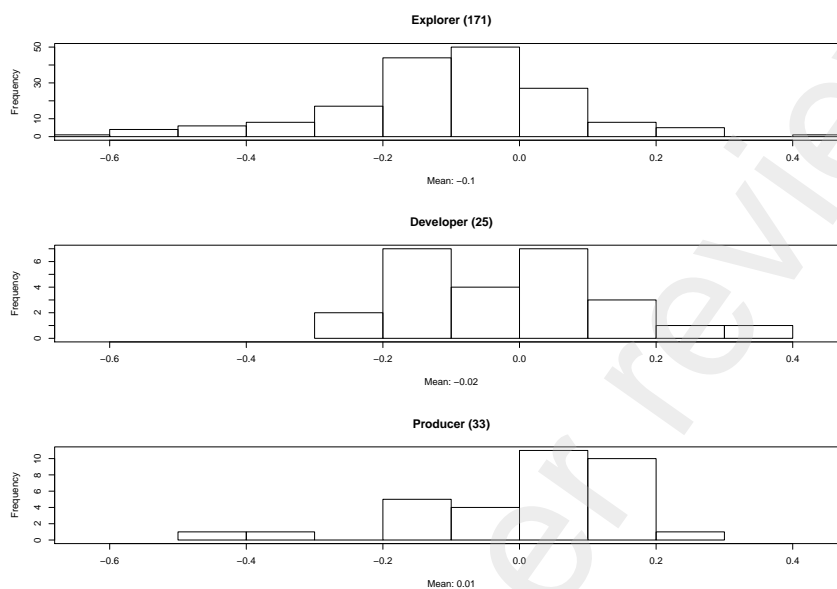


Figure 4: Histograms of Average (raw) Returns for all firms over the full sample period and the COVID period for Explorers, Developers and Producers

(a) Full period



(b) COVID period

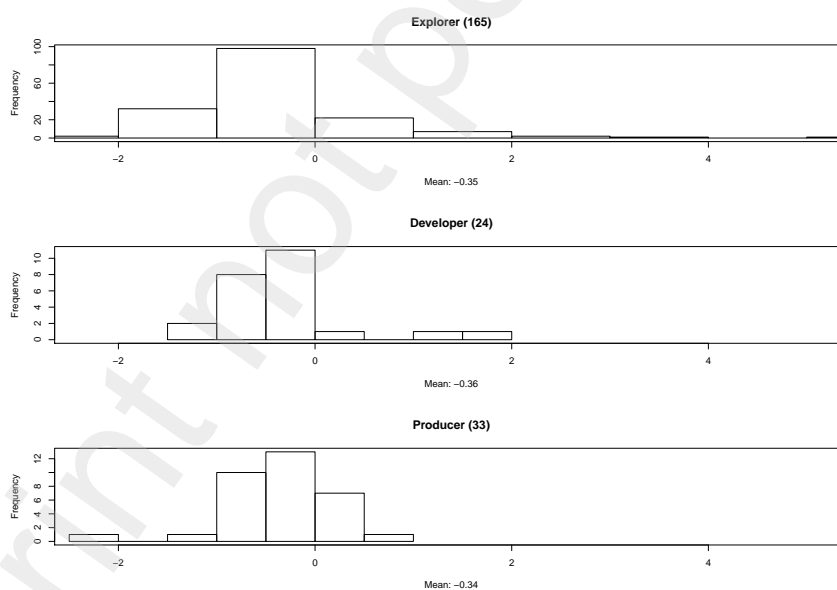
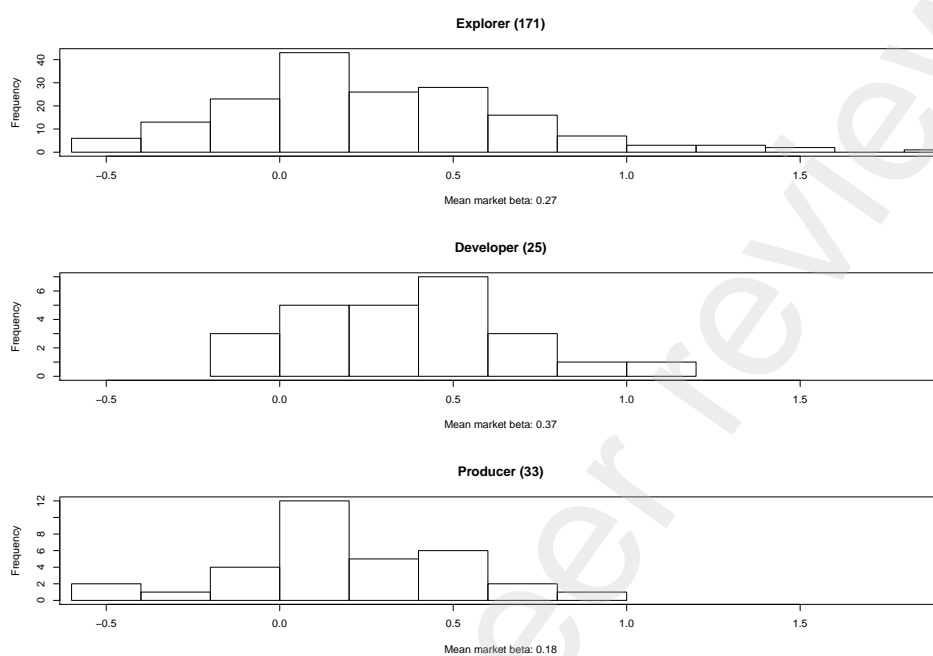


Figure 5: Histograms Market and Gold betas for Explorers, Developers and Producers

(a) Market betas



(b) Gold betas

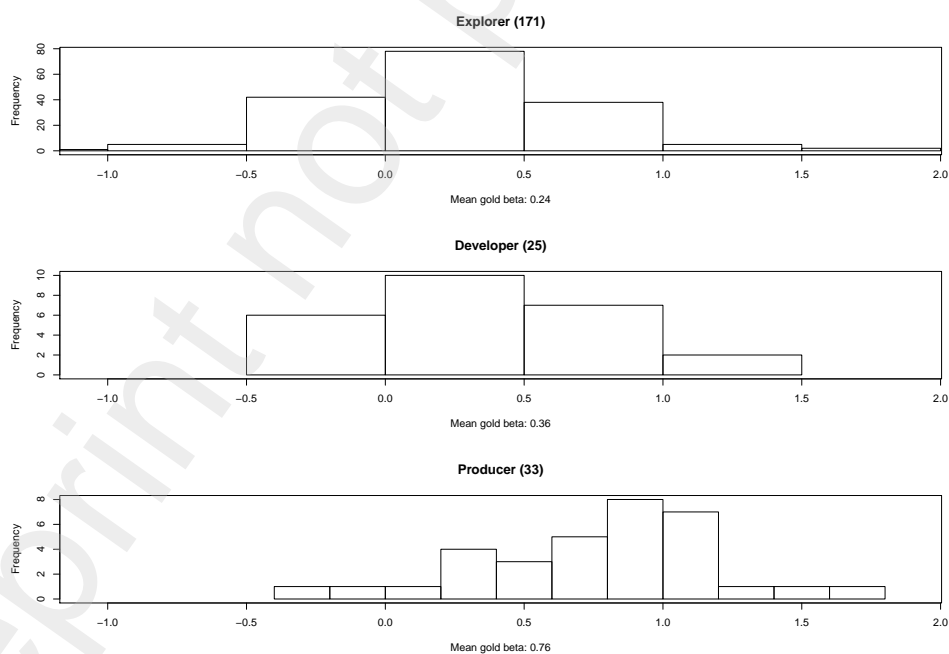
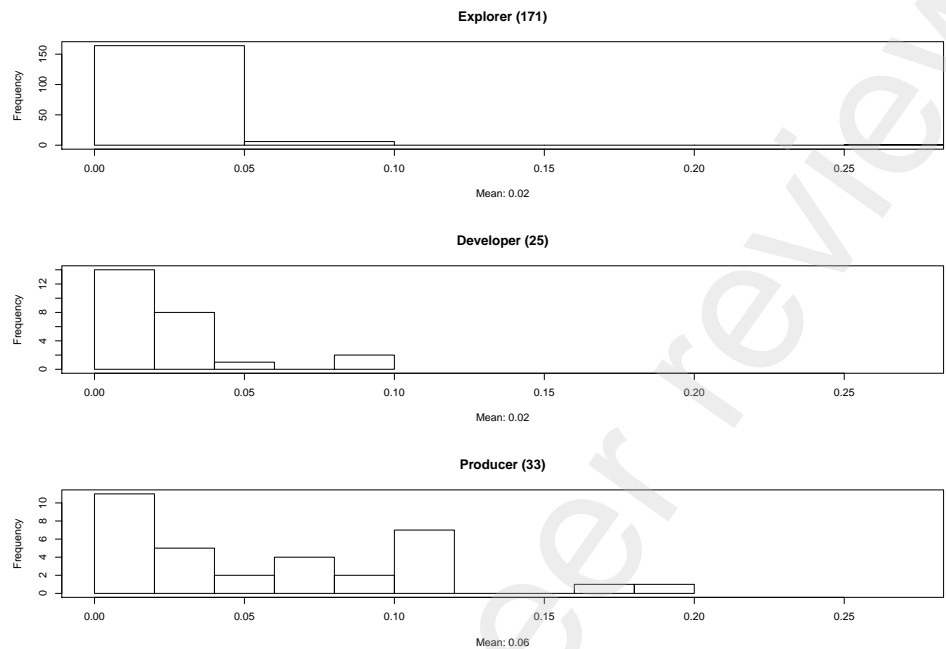


Figure 6: Histograms of R^2 (systematic risk) based on market and gold as systematic risk factors for the full sample grouped by Explorers, Developers and Producers

(a) R^2 based on gold price in US\$



(b) R^2 based on gold price in A\$

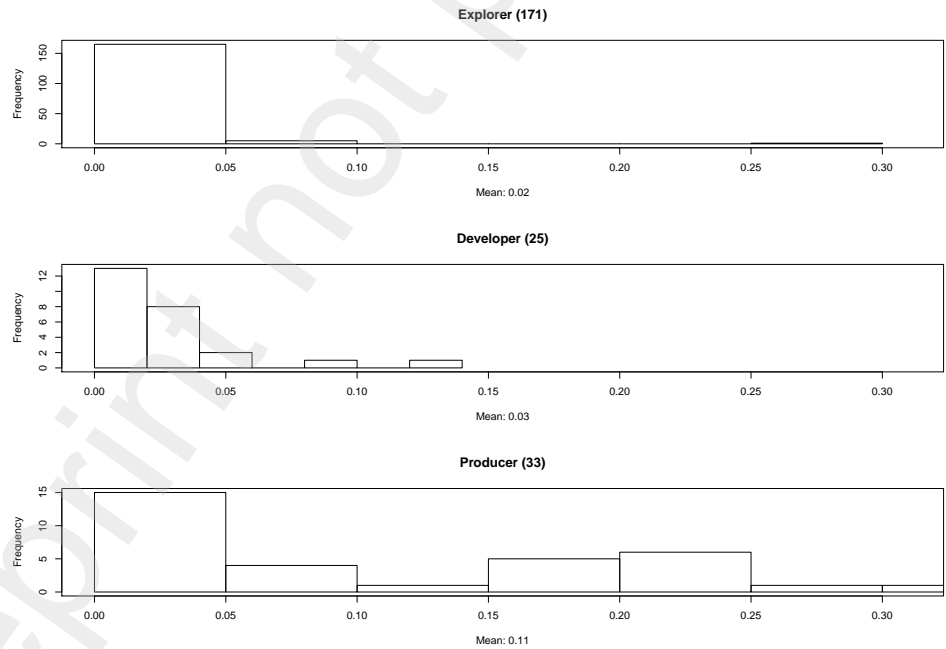


Figure 7: Histograms of R^2 (systematic risk) based on the market and gold (in US\$) as systematic risk factors in the COVID period for Explorers, Developers and Producers

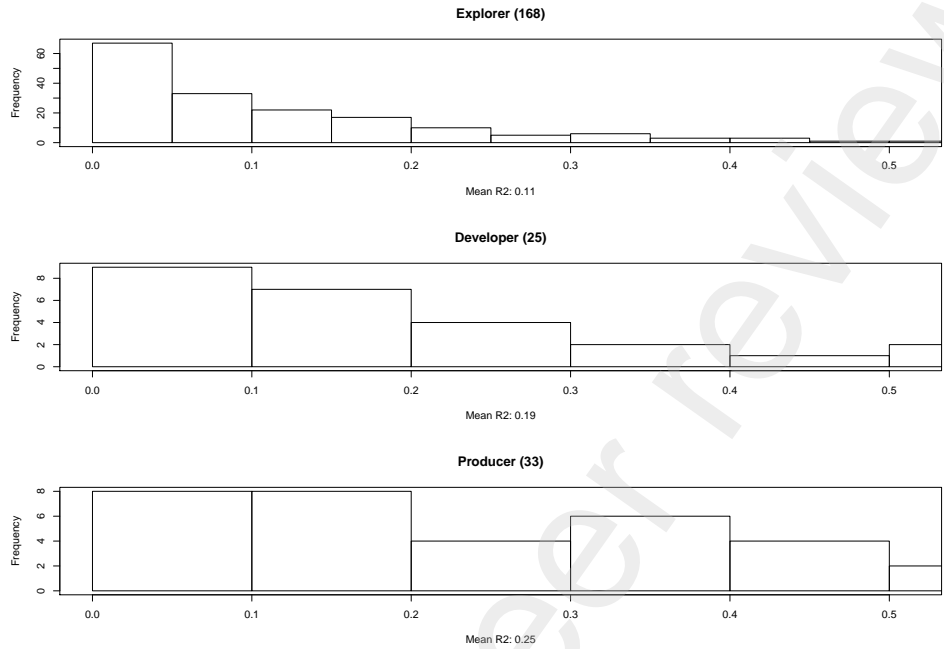


Table 1: Estimation Results

	<i>Dependent variable:</i>	
	gold firm returns	
	gold in US dollar	gold in AUS dollar
	(1)	(2)
market	0.078 (0.059)	0.081 (0.061)
gold	0.012 (0.083)	0.014 (0.085)
market:type1	0.263*** (0.062)	0.320*** (0.064)
market:type2	0.356*** (0.075)	0.471*** (0.078)
market:type3	0.141** (0.072)	0.389*** (0.074)
gold:type1	0.223** (0.087)	0.211** (0.089)
gold:type2	0.366*** (0.106)	0.465*** (0.108)
gold:type3	0.748*** (0.101)	1.017*** (0.103)
Observations	199,970	199,970
R ²	0.004	0.005
Adjusted R ²	0.003	0.004
F Statistic (df = 8; 199718)	108.071***	126.876***

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 2: Estimation Results

	<i>Dependent variable:</i>	
	gold firm returns	
	gold in US dollar	gold in AUS dollar
	(1)	(2)
market	0.222*** (0.020)	0.259*** (0.020)
gold	0.222*** (0.024)	0.303*** (0.023)
COVID	-1.447*** (0.111)	-1.148*** (0.110)
COVID:market	0.012 (0.034)	0.260*** (0.034)
COVID:gold	0.349*** (0.053)	0.276*** (0.059)
Observations	199,970	199,970
R ²	0.005	0.005
Adjusted R ²	0.004	0.004
F Statistic (df = 5; 199721)	197.243***	208.427***
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01	

Table 3: Estimation Results

	<i>Dependent variable:</i>	
	gold firm returns	
	gold in US dollar (1)	gold in AUS dollar (2)
market	0.165** (0.080)	0.163** (0.081)
gold	0.065 (0.095)	0.011 (0.093)
market:COVID	-0.219 (0.135)	-0.233* (0.136)
gold:COVID	-0.098 (0.214)	-0.042 (0.236)
COVID:type1	-1.232*** (0.465)	-0.935** (0.462)
COVID:type2	-0.815 (0.564)	-0.453 (0.560)
COVID:type3	-0.300 (0.538)	0.236 (0.534)
type1:gold	0.081 (0.100)	0.143 (0.097)
type2:gold	0.178 (0.121)	0.450*** (0.117)
type3:gold	0.589*** (0.115)	1.046*** (0.112)
market:COVID:type1	0.170 (0.141)	0.437*** (0.142)
market:COVID:type2	0.457*** (0.171)	0.725*** (0.172)
market:COVID:type3	0.476*** (0.163)	0.829*** (0.164)
gold:COVID:type1	0.490** (0.223)	0.440* (0.246)
gold:COVID:type2	0.520* (0.271)	0.185 (0.298)
gold:COVID:type3	0.393 (0.258)	-0.041 (0.284)
Observations	199,970	199,970
R ²	0.006	0.007
Adjusted R ²	0.004	0.005
F Statistic (df = 20; 199706)	57.129***	66.462***
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01		

Table 4: Firm names and market capitalization (as at December 2019)

	Company.name	mcap		Company.name	mcap
1	NEWCREST MINING LTD	24,493,307	41	TITAN MINERALS LTD	53,382
2	NORTHERN STAR RESR'S	7,451,254	42	OKLO URANIUM LTD	53,228
3	EVOLUTION MINING	7,399,224	43	TANAMI GOLD NL	52,879
4	SARACEN MINERAL	3,019,120	44	APOLLO CONSOL	52,047
5	REGIS RESOURCES	2,681,548	45	AUSTRAL GOLD LTD	50,345
6	ST BARBARA LTD	2,045,222	46	ORECORP LTD	47,831
7	GOLD ROAD RES	1,177,728	47	CALIDUS RES	47,367
8	RESOLUTE MINING LTD	1,137,974	48	EMMERSON RESOURCES	46,734
9	SILVER LAKE RES	1,026,806	49	TIETTO MINERALS LTD	43,566
10	PERSEUS MINING LTD	682,957	50	PRODIGY GOLD NL	42,776
11	WESTGOLD RESOURCES	680,830	51	HORIZON MINE	40,658
12	RAMELIUS RESOURCES	476,958	52	ARDEA RESOURCES	39,805
13	AURELIA METALS LTD	429,600	53	STRATEGIC MINERALS	39,511
14	WEST AFRICAN	374,306	54	FOCUS MINERALS LTD	39,291
15	BELLEVUE GOLD LTD	350,722	55	NAVARRE MINERALS LTD	36,541
16	TRIBUNE RES	302,491	56	GOLD MOUNTAIN LTD	36,281
17	ALKANE RESOURCES	230,276	57	BASSARI RESOURCES	35,633
18	RED 5 LTD	223,770	58	GWR GROUP LTD	35,492
19	PANTORO	215,189	59	EXORE RESOURCES LTD	34,916
20	RAND MINING LTD	197,287	60	LANEWAY RESO	34,801
21	CATALYST METALS LTD	154,629	61	ACTIVEX LTD	34,560
22	CARDINAL RESOURCES	130,174	62	DE GREY MINING LTD	32,923
23	DACIAN GOLD	119,627	63	CHALICE GOLD MINE	31,988
24	MEDUSA MINING LTD	119,482	64	SIHAYO GOLD LIMITED	29,369
25	EMERALD RESOURCES NL	115,606	65	ANTIPA MINERALS	29,069
26	VANGO MINING LTD	103,689	66	KAILI RESOURCES LTD	28,715
27	BBX MINERALS	97,026	67	S2 RESOURCES LTD	28,510
28	GEOPACIFIC RESRCS	87,263	68	KINGSROSE MINING	27,740
29	MAGNETIC RESOURC	84,851	69	NEW TALISMAN	25,974
30	ORMINEX LTD	83,561	70	MATSA RESOURCES	25,653
31	CAPRICORN METALS	83,351	71	KIN MIN	25,136
32	ORA BANDA MINI	77,714	72	GENESIS MINERALS	25,054
33	BEACON MINERALS LTD	72,871	73	BIG RIVER	23,710
34	BREAKER RES	66,658	74	METEORIC RESRCS NL	22,225
35	BARDOC GOLD LTD	64,994	75	SKY METALS	21,394
36	NUSANTARA RESO	61,802	76	ANGLO AUSTRLN	21,273
37	THETA GOLD	61,325	77	ARTEMIS RESOURCES	21,184
38	TROY RESOUR	56,838	78	DGO GOLD LTD	20,982
39	KINGSGATE	55,425	79	MUSGRAVE MIN	20,499
40	AUSMEX MINING	55,224	80	KINGSTON RESOURCES	20,377

Table 5: Firm names and market capitalization (as at December 2019)

	Company.name	mcap		Company.name	mcap
81	NAGAMBIE RESOUR	19,246	121	AFRICAN GOLD LTD	9,877
82	RESOURCES	19,222	122	WHITE ROCK MIN	9,819
83	SATURN METALS LTD	19,093	123	GREAT SOUTHERN	9,709
84	MATADOR MINING LTD	18,789	124	GOLDEN RIM RES	9,402
85	BLACK CAT SYNDI	18,486	125	NEW WORLD COBALT LTD	9,265
86	E2 METALS LTD	18,374	126	EQUUS MINING LTD	8,970
87	ROX RESOURCES LTD	18,078	127	GBM GOLD LTD	8,947
88	HAWTHORN RESOURCES	17,311	128	CITIGOLD CORP LTD	8,639
89	VECTOR RESOU	16,913	129	ALICE QUEEN LTD	8,459
90	LEFROY EXPLORATION	16,645	130	PANTERRA GOLD	8,196
91	NTM GOLD LTD	16,472	131	ALTO METALS LTD	8,100
92	DATELINE RESOURCES	16,271	132	HAMMER METALS LTD	8,078
93	NOVA MINERALS LTD	16,257	133	EMU NL	8,053
94	GALILEO MINING	16,250	134	PURE ALUMINA LTD	7,984
95	COZIRON RESRCS	16,070	135	BATTERY MINERALS	7,909
96	VENUS METALS	15,852	136	DARK HORSE RESO	7,904
97	DUKETON MINING LTD	15,342	137	SOUTHERN GOLD LTD	7,821
98	REX MINERALS LTD.	15,223	138	KALNORTH GOLD	7,154
99	AIC MINES LTD	15,080	139	ALICANTO MIN	7,053
100	ALLIANCE RESOURCES	14,997	140	KINGWEST RESOURCE	6,605
101	CRATER GOLD MINING	14,730	141	ARGENT MINERALS	6,475
102	HAWKSTONE MIN	14,497	142	OKAPI RESOURCES LTD	6,182
103	ORA GOLD	14,214	143	METAL BANK LTD	6,180
104	EUROPEAN COBAL	13,711	144	MAKO GOLD LTD	6,125
105	AUSTAR GOLD LTD	13,561	145	LODESTAR MINERALS	5,994
106	AURA ENERGY LTD	13,463	146	ALT RESOURCES LTD	5,919
107	CARNABY RESOURCES	13,438	147	PATERSON RESO	5,874
108	HORIZON GOLD LTD	13,393	148	METALS AUSTRALIA LTD	5,854
109	KAIROS MINERALS LTD	12,788	149	ANOVA METALS	5,752
110	LOS CERR	12,079	150	CAULDRON ENERGY	5,598
111	MARMOTA LTD	11,771	151	CARAWINE RESO	5,584
112	YANDAL RESOURCES	11,765	152	NEXUS MINERALS LTD	5,439
113	NORWEST MINERALS LTD	11,153	153	STRATEGIC ENERGY RES	5,400
114	CHESSER RESOURCES	10,946	154	ESTRELLA RES	5,304
115	GATEWAY MINING	10,774	155	MANAS RESOURCES LTD.	5,286
116	KALAMAZOO RE	10,739	156	DRAGON MOUNTAIN	5,271
117	AUSGOLD LTD	10,460	157	ARDIDEN LTD	5,044
118	AMANI GOLD LTD	10,426	158	AUTECO MINERALS LTD	5,012
119	MONT ROYAL RES	10,176	159	EMPIRE RESOURCES LTD	4,977
120	AZURE MINERALS LTD	9,990	160	CASSIUS MINING LTD	4,964

Table 6: Firm names and market capitalization (as at December 2019)

	Company.name	mcap		Company.name	mcap
161	CAPRICE RESO	4,913	201	ASTRO RESOUR	2,544
162	ALCHEMY RESOURCES	4,845	202	NEX METALS EXPLOR	2,506
163	WEST WITS MINING	4,800	203	GREENVALE ENERGY	2,427
164	GBM RESOURCES	4,701	204	MAXIMUS RESRCS	2,402
165	DREADNOUGHT	4,644	205	MOHO RESOURCES LTD	2,252
166	GREAT WESTERN EXPL	4,633	206	DISCOVERY AFRICA	2,187
167	LITHIUM CONSOLIDATE	4,632	207	RESOLUTION MI	2,178
168	PREDICTIVE DISC	4,426	208	KULA GOLD LTD	2,175
169	DAMPIER GOLD LTD	4,416	209	CERVANTES CORP	2,144
170	GREAT BOULDER RES	4,407	210	RENEGADE EXPLORATION	2,138
171	LEGACY IRON ORE	4,405	211	MGMTC	2,110
172	METALICITY LTD	4,373	212	XANTIPPE RES	2,026
173	BLAZE INT'L LTD	4,200	213	RIVERSGOLD LTD	2,023
174	MIDDLE ISLAND RESOU	4,187	214	ARUMA RESOURCES	1,972
175	SUPERIOR RESOURCES	4,125	215	GREAT NORT	1,943
176	DART MINING NL	4,046	216	TESORO RESOURCES	1,931
177	GENESIS RESOURCES	3,914	217	AUKING MINING LTD	1,865
178	JADAR RESOUR	3,844	218	METALSTECH LTD	1,754
179	TYRANNA RESOURCES	3,767	219	CANNINDAH RES	1,631
180	RIEDEL RESOURCES	3,763	220	SABRE RESOURCES LTD	1,628
181	AUSTRALIA	3,685	221	STONE RESOU	1,623
182	TARUGA MINERALS LTD	3,671	222	CULLEN RESOURCES LTD	1,525
183	ARROW MINERALS LTD	3,460	223	GLADIATOR RESRCS	1,469
184	ALLOY RESOURCES LTD	3,387	224	TERRAIN MINERALS LTD	1,287
185	RIMFIRE PACIFIC MNG	3,209	225	TREK METALS LTD	1,192
186	INDIANA RESOU	3,109	226	CASTLE MINERALS LTD	1,119
187	CLASSIC MI	3,006	227	3D RESOURCES LTD	1,107
188	CYGNUS GOLD LTD	3,003	228	TRUSCOTT MINING CORP	1,061
189	FIRST AU LTD	2,988	229	RESOURCE BASE	935
190	MANHATTAN CORP	2,965	230	SCORPION	752
191	TWENTY SEVEN CO LTD	2,943			
192	TORIAN RESOURCES LTD	2,842			
193	WOOMERA MINING LTD	2,817			
194	SULTAN RESOURCES LTD	2,810			
195	NIUMINCO GR	2,800			
196	OAKDALE RESOURCES	2,777			
197	NELSON RESOURCES LTD	2,736			
198	GOLDEN	2,719			
199	BULLETIN RESOURCES	2,689			
200	SOUTHERN HEMIS	2,566			