Flight to Quality - Gold Mining Shares versus Gold Bullion

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Abstract

This paper uses the co-movement of gold mining shares with the price of gold to assess the strength of flight to quality and the severity of financial shocks by distinguishing between flight to physical gold and flight to gold mining companies. The analysis of a global sample of gold mining companies reveals that flights to quality are very different across financial shocks with the bankruptcy of Lehman Brothers and the Brexit vote being the most extreme at opposite ends of the spectrum. We also find evidence that a flight from gold mining shares leads to a stronger price reaction and thus safe haven effect of gold bullion. This study demonstrates that gold mining companies can enrich our understanding of the flight to quality phenomenon.

Keywords: gold; safe haven; flight to quality; gold mining; financial shocks
JEL Classification: G01; G11; G14

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1 Introduction

Imagine a port for boats. Whenever there is a storm forecast boats will seek the shelter of the port and only leave the port when the storm dissipates. Some types of boats are always in the proximity of the port and only need to seek shelter if the storm is severe. When boats seek shelter the port becomes crowded and the price of shelter increases.

The above is an analogy for the role of gold and gold mining companies in the financial system. Stocks are the "boats", gold is the "port", gold mining company stocks are the "boats in the proximity of the port", financial turmoil is the "storm" and flight to quality is the "boats seeking shelter".

This paper is motivated by the observation that gold mining companies are related to the price of gold and to the market as shown in Figure 1. The scatter plot of gold and market betas for a liquid sample of gold mining companies shows a trade-off represented by a relation of higher market betas with lower gold betas and lower market betas with higher gold betas. Whilst some gold mining shares exhibit gold betas equal to one, the average market beta is well above zero and even the smallest market betas are larger than 0.25.[1]

[Figure 1 about here.]

The double exposure of gold mining companies to gold price risk and market risk leads to some important questions. What happens in a crisis when gold assumes its safe haven characteristic? Do the prices of gold mining shares increase with the price of gold or fall with the market in a crisis period? We exploit the cross-section of gold mining companies to answer these questions and to enhance our understanding of the role of gold and gold mining companies in normal times and during financial turmoil.

[1]The full sample including relatively illiquid gold mining companies exhibits smaller market betas and gold betas compared to the liquid sample. Non-trading days and thus zero returns bias market and gold betas towards zero which potentially explains the fundamentally different, i.e. positive, relationship between market betas and gold betas.

We find that the performance of gold mining companies relative to gold depends on the severity of the financial shock or crisis. If the shock is extreme, e.g. the bankruptcy of Lehman Brothers, there is a flight to gold ("quality") from all stocks including the stocks of gold mining companies. In contrast, if the shock is less extreme, e.g. after the Brexit vote, there is a flight to both gold and gold mining shares inconsistent with a "classical" flight to quality. It seems that investors prefer physical and thus tangible gold in extreme turmoil but are less concerned about the tangibility in less extreme periods.

The Brexit results even reveal an extreme (and unusual) case of flight to gold with gold mining shares significantly exceeding the positive returns of gold. We argue that this effect suggests that investors use the safe haven characteristic of gold not to reduce the risk but rather to increase the risk of their portfolios by investing in gold-related assets employing a (risky) "safe haven trade".[2] The analysis also shows that many gold mining shares are rather illiquid which implies that they cannot be traded in a crisis period at low cost (if at all) and that there is a flight to liquid gold mining shares or the more liquid gold bullion. Finally, we also uncover a link between the strength of the flight to gold bullion and the flight from gold mining companies, i.e. the stronger the flight from gold mining companies is the stronger is the flight to gold bullion and vice versa. Whilst it is not surprising that the price effect is stronger if investors focus on one asset (gold) than on many assets (gold and gold mining shares) this finding is still novel.

The related literature covers studies on flight to quality or flight to safety and safe haven phenomena that do not analyze gold or gold mining companies, e.g. Kaul and Sapp (2006) and Ranaldo and Söderlind (2010) on safe haven effects of currencies and

[2]This conclusion is based on the assumption that gold stocks are more risky than gold bullion. An alternative view is that an investment in a portfolio of gold bullion and gold stocks is more diversified and thus less risky than an undiversified investment into gold bullion.

Gulko (2002), Connolly et al. (2005), Baur and Lucey (2009) and Baele et al. (2018) on flight to quality between stocks and bonds. Beber et al. (2009) investigate investors' demand for quality and liquidity in different market conditions and find that liquidity is more important than quality.

Studies that analyze the financial characteristics of gold and its role as a hedge include Sherman (1982), Jaffe (1989), Capie et al. (2005), Faugère and Van Erlach (2005) and Lucey et al. (2006). An extension of the hedge characteristic of gold to periods of financial turmoil was introduced by Baur and Lucey (2010) for stocks and bonds and extended to a more comprehensive sample of markets in Baur and McDermott (2010). Chan et al. (2011) and Ciner et al. (2013) further expanded the analysis and included commodities (oil) and real estate and find that Treasury bonds and gold act as safe havens. Creti et al. (2013) examine links between 25 commodities and the stock market and find empirical evidence in support of the safe haven role of gold. Reboredo (2013) use copulas to model the relationship between gold and the US dollar and find strong support for the role of gold as a hedge and a safe haven (see also Beckmann et al. (2013) and Bredin et al. (2015)).

The value of gold mining companies and their exposure to the price of gold is analyzed in Tufano (1996). Rockerbie (1999), Selvanathan and Selvanathan (1999) and Moel and Tufano (2002) study the real option of gold mining companies to open and close mines. Adam et al. (2017) address the question why companies engage in selective hedging and find that smaller gold mining companies speculate more than larger ones. Other studies on the relationship between gold bullion and gold mining shares include Borenstein and Farrell (2008), Batten et al. (2017) and Reboredo and Ugolini (2017). Areal et al. (2013) find that US gold stocks act neither as a hedge nor as a safe haven for the US stock market.

To the best of our knowledge there is no study that distinguishes between a flight

to (physical) gold and a flight to gold mining companies and no study that uses this distinction to measure the strength of flight to quality and the severity of a financial shock or crisis. Moreover, there is no study that uses a large and global sample of small-cap, mid-cap and large-cap gold mining companies to measure flight to quality or more precisely flight to gold.

We contribute to the literature with an identification of different types of flight to quality. This distinction allows an assessment of the severity of financial crisis and a deeper understanding of investor behavior during financial crises. The roles of the liquidity of gold mining shares and the size of gold mining companies are also examined. Finally, we also contribute to the literature with an analysis of potential profit opportunities originating from a decoupling of gold mining companies from the price of gold during a crisis and an eventual recoupling after a crisis.

The paper is structured as follows: Section 2 introduces the data and presents descriptive statistics of the global sample of gold mining companies, gold and stock markets. Section 3 presents the empirical analysis with the econometric modelling framework, the estimation results and a detailed discussion and interpretation of the results. Finally, Section 4 summarizes the main findings and provides concluding remarks.

2 Data

Our initial sample consists of 648 mining companies whose primary resource exploration, production or processing activities are attributed to the gold market according to Thomson Reuters Eikon. While companies of our initial sample are being traded on nineteen distinct markets, the vast majority of mining stocks is listed on either the Australian, Canadian, UK or US market. Thus, we constrain our sample on these mar-

kets, leaving us with 609 gold mining companies to cover approximately 85% of the total market capitalization of the gold mining sector.

Daily prices from January 1997 until September 2018 are obtained from Thomson Reuters Eikon resulting in more than 5,000 observations per firm. Whilst the large number of gold mining companies allows a broader and potentially deeper analysis of the flight to gold phenomenon, it is important to note that many gold mining companies are relatively small and their shares illiquid, i.e. there are many days, often more than 50%, when there is no trading and no price change. Hence, we adhere to Lesmond et al. (1999)'s suggestion to measure illiquidity of assets in financial markets based on the proportion of days with zero returns.[3] According to their study, informed investors avoid trading when transaction costs surpass the expected profits from trading, resulting in a zero return observation on that day. Employing this framework, we base our analysis on stocks which have at least 50% non-zero return observations over their complete sample period, leaving us with 175 companies in our full sample. To shed light on the role of liquidity for the safe haven property, we additionally identify a more liquid sub-sample consisting of stocks that possess at least 80% non-zero return observations.[4] The latter contains 49 of 175 gold mining companies. Moreover, we divide gold stocks of our full sample into three equally-sized groups composed of small cap, medium cap and large cap companies.

The sample also consists of the daily price of gold in US dollars per Troy ounce from the London Bullion Market and four stock market indices (ASX 200 for Australia, TSX Composite for Canada, FTSE All Share for the UK and S&P 500 for the US) corresponding to the four market sample of gold mining companies.

[3] Formally, $IL_i = \frac{\sum_{t=1}^{T_i} \mathbb{1}\{r_{i,t}=0\}}{T_i}$, where T_i is the total amount of return observations of stock i, and the indicator function $\mathbb{1}\{\cdot\}$ takes value of 1 for zero returns r of stock i at time t.

[4] While this threshold is chosen arbitrarily, we find it reasonable to argue that stocks which are traded on at least 80% of all trading days can be considered as liquid in the context of this study.

Tables 1-4 present descriptive statistics of the returns on gold mining shares, gold returns and market returns. They reveal that gold mining companies exhibit both lower returns and higher risk than gold. For example, Table 4 shows that only one out of eleven gold mining companies listed in the US exhibits a higher average return and all gold mining shares are more risky than gold. Additional analysis of the NYSE ARCA Gold Bugs and the ARCA Gold Miners price indices confirm this result.[5]

[Table 1 about here.]

[Table 2 about here.]

[Table 3 about here.]

[Table 4 about here.]

3 Empirical Analysis

There are many studies that have shown that gold is uncorrelated with the market in normal times and in crisis times. In other words, gold has a market beta of zero and, per definition, a gold beta of one. In contrast, there are less studies on gold mining companies, their market betas and gold betas (see Baur (2014) and references therein). Figure 1 displays the distribution of market betas and gold betas for all gold mining companies in scatter plots pooled over the four markets considered (Australia, Canada, the UK and the US). A summary of the estimates is presented in Table 5 for the full sample of gold mining companies and a sub-sample of companies with liquid gold mining shares. It shows that the market betas and gold betas generally deviate substantially from zero and one, i.e. from the gold benchmark. This implies that most

[5]For the 2010 - 2019 sample period, the daily returns are -0.037% and -0.028%, and the standard deviations of the returns are 2.4 and 2.1, respectively. The mean gold bullion return and standard deviation for the same period are 0.008% and 0.99, respectively.

gold mining companies are very different from gold on average. The coefficient estimates are generally larger for the liquid sample making it more gold-like in terms of the gold beta but also less gold-like in terms of the market beta.

[Table 5 about here.]

However, the average market and gold betas do not automatically imply that the relationships among gold mining shares, the stock market and gold bullion are constant during crisis periods. Since the correlation of gold with the market also varies in normal periods and in crisis periods, it is possible that gold mining betas vary through time and gold mining shares become more or less gold-like in crisis periods.

We test this hypothesis with the following models

$$r_{i,t} = a + \beta_1 r_{Gold,t} + \beta_2 r_{Gold,t} \mathbb{1}\{r_{S,t} < q_5\} + e_{i,t}, \quad (1)$$

$$r_{i,t} = b + \gamma_1 r_{Gold,t} + \gamma_2 r_{Gold,t} D_1 + \gamma_3 r_{Gold,t} D_2 + \gamma_4 r_{Gold,t} D_3 + e_{i,t}, \quad (2)$$

$$r_{i,t} = a + \delta_1 r_{Gold,t} + \delta_2 r_{Gold,t} \mathbb{1}\{\sigma_{S,t} > q_{95}\} + e_{i,t}, \quad (3)$$

where $r_{i,t}$ denotes the return of gold mining company i at time t, $r_{Gold,t}$ denotes the gold bullion return, $r_{S,t}$ denotes the return of the domestic stock market index and $\sigma_{S,t}$ denotes the estimated volatility of the domestic stock market index at time t. Using the first model, we investigate if gold betas increase in response to extreme negative daily shocks in the stock market (below the 5% quantile over the full sampling period, denoted q_5) and the second model focuses on three financial turmoil periods, the September 11, 2001 terrorist attacks, the bankruptcy of Lehman Brothers in September 2008 and the Brexit vote in June 2016. We use 20 trading days as duration of the events for an initial analysis but also study shorter and longer event windows. The third model considers

periods in which the volatility of the domestic stock market exceeds its 95% quantile, denoted q_{95}.

The chosen 95% quantile threshold yields 284 extreme periods and corresponds roughly to our pre-selected crisis events. Choosing higher threshold values, e.g. the 99% quantile, only selects periods during the global financial crisis (including the bankruptcy of Lehman Brothers). We therefore use the 95% quantile to balance the need for extreme periods and a sufficiently large sample size. Figure 2 illustrates for the US sample how the dummy definitions lead to the identification of different shock or crisis periods across the three models.

[Figure 2 about here.]

The graph also illustrates that the shocks are potentially too scattered in model 1 to identify clear and unique safe haven events and that model 2 and model 3 provide a more reliable identification of financial shocks.

The estimation results presented in Tables 6-9 show that there is no homogeneous reaction of the gold betas to extreme negative shocks. The majority of estimates are positive for all countries except for the UK where almost all estimates of β_2 are negative. The crisis-specific reaction is more homogeneous with the first and second crises displaying mostly negative beta estimates (β_2 and β_3). The third crisis period within Specification 2 exhibits positive crisis-betas for almost all firms across all countries. Finally, the third model (Specification 3) based on extreme volatility yields negative beta estimates on average (mean reported in the Summary) for all countries except for the US. These results indicate varying exposures of gold mining shares to the price of gold with a clear decoupling from the price of gold in response to large shocks, in specific crisis periods and in periods of high volatility. In the majority of cases there is a flight from gold mining companies to gold (bullion). Only in response to the Brexit vote there is a positive reaction of gold betas.

The results for the full sample including companies with relatively illiquid shares yield similar results in general. However, due to the lower liquidity, the gold beta estimates are generally smaller in absolute terms compared to the more liquid sample. This finding is intuitive given the non-trading zero return observations in the illiquid sample which leads to lower absolute betas.

[Table 6 about here.]

[Table 7 about here.]

[Table 8 about here.]

[Table 9 about here.]

Since the beta estimates may be noisy due to the relatively short crises periods we also consider an alternative framework based on an unconditional and conditional ("classical") event study methodology. We calculate (i) unconditional cumulative returns (CR) and (ii) conditional cumulative abnormal returns (CAR) over each crisis period for each gold mining company. While the CR estimates do not require any model, the CAR estimates are based on a simple market model with gold returns being the market. The two models also differ in another and more important aspect: the CR analysis investigates if gold mining companies hold their pre-crisis value and thus act as a safe haven, and the CAR analysis evaluates whether investors show a preference for gold mining companies over gold.

3.1 Unconditional Cumulative Returns

We calculate the cumulative returns (CR) for each gold mining company i over the event window $[\tau_1, \tau_2]$,

$$\widehat{CR}_i = \sum_{t=\tau_1}^{\tau_2} \hat{r}_{i,t}, \tag{4}$$

and interpret the sign of the CRs over different event windows. More specifically, we use the cumulative returns (CR) to identify if gold and gold mining companies act as a weak or strong safe haven as follows:

- CR $= 0$: weak safe haven
- CR > 0: strong safe haven
- CR < 0: no safe haven

If the cumulative return is not different from zero, the gold mining company exhibits the dynamics of a weak safe haven. If the cumulative return is greater than zero, the company exhibits the dynamics of a strong safe haven and if the cumulative return is smaller than zero the company does not display features of a safe haven. We analyze cumulative returns for all gold mining companies divided into groups by their respective market capitalization and exploit the full cross-section of companies to obtain average estimates of the safe haven effect.

Figures 3 - 6 show the evolution of the unconditional cumulative returns of gold, small-cap, mid-cap and large-cap gold miners and the respective market over the three crisis periods.

[Figure 3 about here.]

[Figure 4 about here.]

[Figure 5 about here.]

[Figure 6 about here.]

The graphs illustrate that the price of gold mining shares followed the price of gold during the 9/11 crisis, clearly negatively decoupled from the price of gold during the bankruptcy of Lehman Brothers and positively decoupled from the price of gold after the Brexit vote. Large-cap gold miners tend to follow the price of gold the closest whereas the effects are generally smaller for mid-cap gold miners and small-cap gold miners. Table 10 supports the graphs and condenses the information to 5-day intervals. The strongest negative reaction is observed after the bankruptcy of Lehman Brothers whilst the strongest positive reaction is observed after the Brexit vote. Although the results for 9/11 are less clear-cut, they indicate that some gold mining companies acted as a safe haven during that period. The numbers confirm that large-cap miners generally outperform mid-cap and small-cap miners. The last row of the Table presents the cross-sectional average over all gold mining companies in each country and a cross-sectional test that the average is zero.

Our CR estimates also reveal a negative relationship between the magnitude of the gold safe haven effect and the reaction of gold mining companies, i.e. the larger and stronger the gold price reaction is the stronger is the decoupling and vice versa. In other words, if investors flee from stocks and even from gold mining companies the effect on gold is stronger compared with a situation when investors flee from stocks but not from gold mining companies. If the flight is concentrated on one asset the price impact is stronger than if the flight is distributed over a larger set of assets, gold and gold mining shares. During the Lehman Brothers crisis, it seems that the flight to gold was focused on gold and did not include gold mining companies resulting in the strongest positive gold price reaction and the strongest negative gold mining share price reaction in comparison with the 9/11 crisis and the Brexit vote. The US sample also presents a clear role of large-cap miners versus mid-cap miners with the former outperforming mid-cap miners in all crisis periods. This role of large-cap miners is less

clear and less pronounced for mining companies listed on the Australian, Canadian and UK stock exchanges. One explanation for this finding may be related to the anecdotal evidence that US gold miners generally do not hedge their gold price exposure whereas miners in other countries do.

[Table 10 about here.]

3.2 (Conditional) Cumulative Abnormal Returns

In a second step, we use a "classical" event study framework following MacKinlay (1997) and analyze CARs in a crisis period. We estimate the following gold market model based on a 2-year pre-crisis period estimation window,

$$r_{i,t} = a + b\, r_{Gold,t} + e_{i,t}, \tag{5}$$

for each gold mining company i. Thereby, we define gold bullion as our market to precisely measure the individual gold mining company's performance relative to gold bullion in crisis periods. We predict the returns in the event window, $\hat{r}_{i,t}$, using the coefficient estimates of Equation (5) and calculate the abnormal returns $\widehat{AR}_{i,t}$ as

$$\widehat{AR}_{i,t} = r_{i,t} - \hat{r}_{i,t}, \qquad t = \tau_1, \tau_1 + 1 \ldots, \tau_2, \tag{6}$$

for the event window $[\tau_1, \tau_2]$ with length L. The cumulative abnormal returns are the sum of all abnormal returns over the event window:

$$\widehat{CAR}_{i,t} = \sum_{t=\tau_1}^{\tau_2} \widehat{AR}_{i,t}. \tag{7}$$

To evaluate whether the CARs are significantly different from zero, we compute the test statistic

$$\frac{1}{\sqrt{\tau_2 - \tau_1}}(\widehat{CAR}_{i,t}/\hat{\sigma}_i), \tag{8}$$

where $\hat{\sigma}_i^2$ is the sample variance estimated from the residuals of Equation (5) over the full sample. The factor $1/\sqrt{\tau_2 - \tau_1}$ adjusts for the event window length over which the cumulative abnormal returns are computed. Rejecting the null hypothesis would mean that gold mining company i performs significantly different from gold bullion in crisis periods. The signs of our estimated CARs do not only provide us with information about what type of assets investors buy and sell but also their preference for gold mining shares versus gold bullion. We propose the following interpretation of zero, positive and negative CARs:

- CAR $= 0$: weak flight to gold (bullion)
- CAR > 0: no "classical" flight to gold (bullion) but to gold mining shares (safe haven trade)
- CAR < 0: strong flight to gold (bullion)

While CRs identify the existence of the safe haven property of gold mining companies, CARs determine the strength of a flight to gold. Should the CARs be zero, prices for gold mining shares follow similar trajectories as gold bullion and we interpret this as evidence for investors not having a preference for gold (bullion) over gold mining shares in crisis periods. This in turn means, that if the flight to gold includes gold mining shares there is a weak flight to gold (bullion) and if the flight to gold excludes gold mining shares (negative CARs, i.e. a flight from gold mining shares) there is a strong flight to gold (bullion). Positive CARs display a preference for gold mining shares and thus a non-classical flight to quality as the "quality" is not a low risk asset but a high

risk asset. In this scenario investors trade on the safe haven property assuming that gold mining shares are strongly linked to gold.

CARs computed in this way do not only enable us to identify a potential preference for gold mining shares relative to gold but also a longer-term decoupling of gold mining shares from gold. We investigate such decoupling phenomena by analyzing the evolution of CARs over time after the crisis event. This analysis is motivated by the idea that a crisis-induced decoupling of the price of gold mining shares from the price of gold implies a temporary mispricing and an expected recoupling with the price of gold to its pre-crisis relationship.

The results of the Cumulative Abnormal Return analysis for liquid stocks are shown in Table 11 and display a preference for gold (bullion) in the 9/11 crisis, a very strong preference for gold in the Lehman Brothers crisis and a similar preference for gold mining shares (contrasting the flight to gold effect) after the Brexit vote. There are again differences between large-cap and mid-cap miners most evident for the US-listed mining companies. The differences for the US sample indicate that investors have a preference for large-cap gold miners over mid-cap gold miners. In contrast, the results for the Australian and Canadian samples show that large-cap gold miners are not preferred in any crisis period or sub-period.

[Table 11 about here.]

The Brexit episode also shows that mid-cap miners play a bigger role and outperform large-cap miners in some markets consistent with a flight to the more risky gold miners in general and a flight to the even more risky (because less liquid) mid-cap gold miners. Interestingly, there is no flight to small-cap miners in the US.

Finally, we analyze the trading volume of large-cap, medium-cap and small-cap miners for all markets and all three crisis-periods and find that large cap miners dominate

the trading volume and that severe crisis episodes are also reflected in drops in trading volume most pronounced during the bankruptcy of Lehman Brothers (see Figures 7-10 in the Appendix).

3.3 Profit Opportunity due to Recoupling

This section analyzes if any mispricing of gold mining shares due to a decoupling of the share price from the price of gold leads to a correction and realignment of the share price and the gold price to pre-crisis levels over the subsequent year. Table 12 provide long-term CAR estimates and show that there is a reversal over 50, 100, 150 or 200 days with respect to the start of the crisis period.[6]

The negative mispricing (prices of gold mining shares fell and decoupled from gold) in the 9/11 and Lehman Brothers crises and the positive mispricing (prices of gold mining shares increased and decoupled from gold) after the Brexit vote are fully corrected over longer horizons. Specifically, the negative decoupling for the 9/11 crisis is fully corrected after 50 days but only after 150 to 200 days for the Lehman Brothers crisis; the positive decoupling after the Brexit vote is fully corrected after 50 days. These corrections and re-alignments to the pre-crisis gold price relationship imply very large returns for some crises and some gold mining companies. For example, the percentage return of an investment in large-cap gold miners in response to a decoupling yield returns up to 80% for Australian and US-listed shares for the 9/11 crisis. The returns are generally smaller but qualitatively similar for a larger sample of gold mining companies due to the inclusion of less liquid shares with more zero-return days.

[Table 12 about here.]

[6]The decoupling and recoupling is also observed for an alternative market model with both gold and stock index returns included.

4 Summary and Concluding Remarks

This paper uses a large sample of gold mining companies traded on four stock markets to identify different types of flight to gold or more broadly "quality". We propose that the severity of a shock or crisis can be measured through flight to gold mining shares. If investors flee from stocks including gold mining shares to gold bullion, the crisis is more severe than if investors only flee from stocks excluding gold mining shares. This highlights that the study of gold mining companies provides important additional information in the context of flight to quality and safe haven effects. The analysis of three crisis periods reveals that the bankruptcy of Lehman Brothers in 2008 and the subsequent global financial crisis was the most severe in this sense with a strong flight from gold mining shares to gold. The 9/11 terrorist attacks do not display an equally strong flight to gold and no clear flight from gold mining shares. The Brexit vote in 2016 reveals a very different pattern, a flight to gold mining shares that we interpret as a safe haven trade, i.e. investors seem to seek more risky investments speculating on a safe haven effect of gold and gold mining companies. The Brexit results suggest that investors learned from the safe haven performance of gold in the past and used the gold share - gold bullion relationship to speculate on the safe haven effect.

We also exploit the crisis-specific cross-sectional effects across gold mining companies and find a negative relationship between the strength of the safe haven effect of gold and the strength of the flight from gold mining shares. The broader a flight to quality is, i.e. from stocks to gold and gold mining shares, the lower is the concentration and thus price pressure on gold. In contrast, the narrower a flight to quality is, i.e. from stocks including gold mining shares to gold, the stronger is the concentration and effect on the gold price.

Our study shows that gold mining companies play a critical role in crisis periods and this information can be used to enhance our understanding about investor behavior

during times of financial turmoil. The relationship between gold mining shares and the price of gold also implies that a flight to gold excluding gold mining shares leads to a temporary decoupling and thus long term profit opportunities based on an expected recoupling of gold mining shares with the price of gold.

This paper contributes to the literature on gold as a safe haven and flight to quality and touches upon liquidity and tangibility. However, more research on the role of liquidity is needed and more research on the role of physical assets and their tangibility in comparison with the non-tangible gold shares is required. Do investors seek out liquid and safe assets in a crisis or are they content with a relatively or temporarily illiquid asset that holds its value during a crisis? This depends on whether investors want to sell the asset in a crisis or whether they want to use it merely as collateral. In the latter case, they may not primarily require liquidity but safety.

Since even large-cap and thus relatively liquid gold mining shares are sold in times of severe financial turmoil, the findings suggest that investors assign special value to physical gold and thus physical assets. This provides interesting research avenues with regard to the financialization and the digitalization of assets.

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6 Appendix

[Figure 7 about here.]

[Figure 8 about here.]

[Figure 9 about here.]

[Figure 10 about here.]

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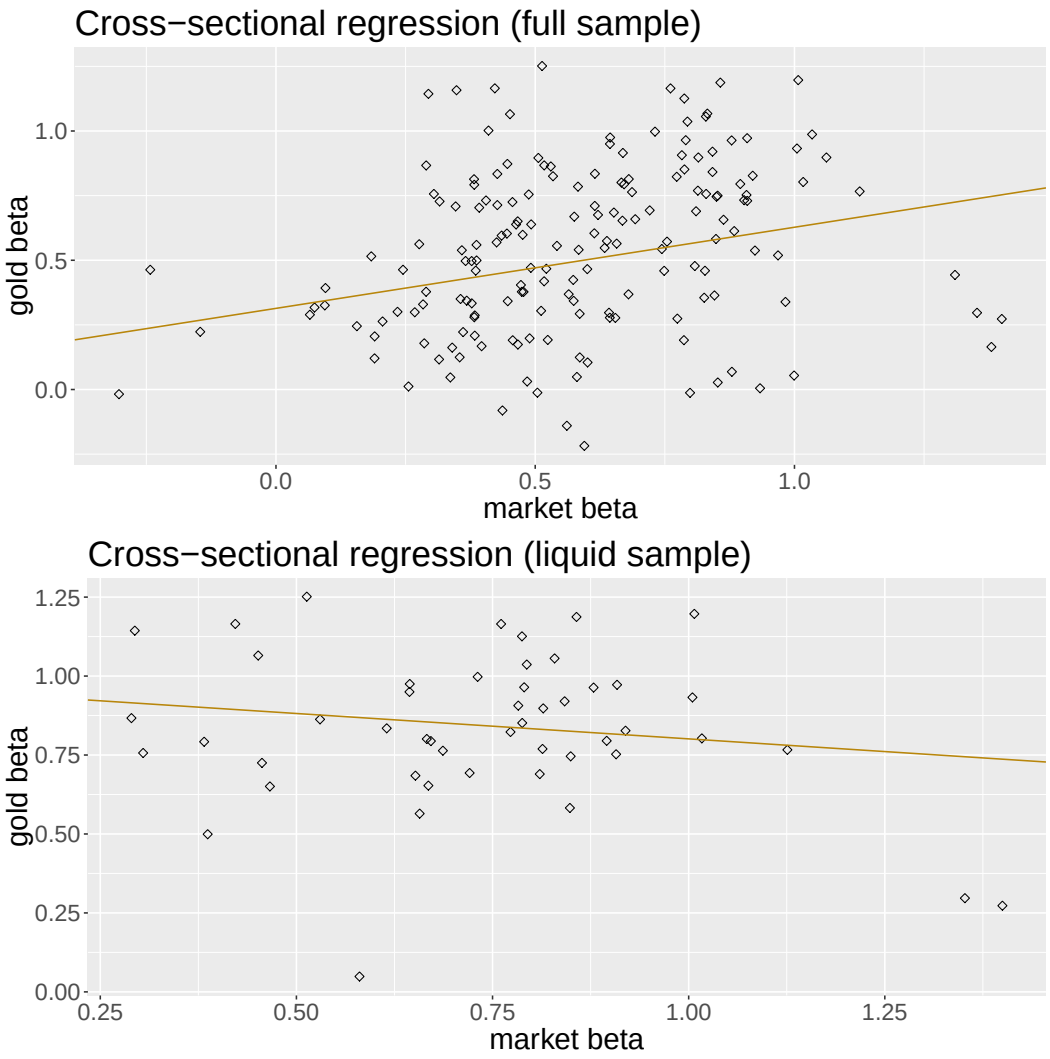

Figure 1: Cross-sectional regression of gold betas on market betas. Full sample (upper panel) and liquid sample (lower panel)

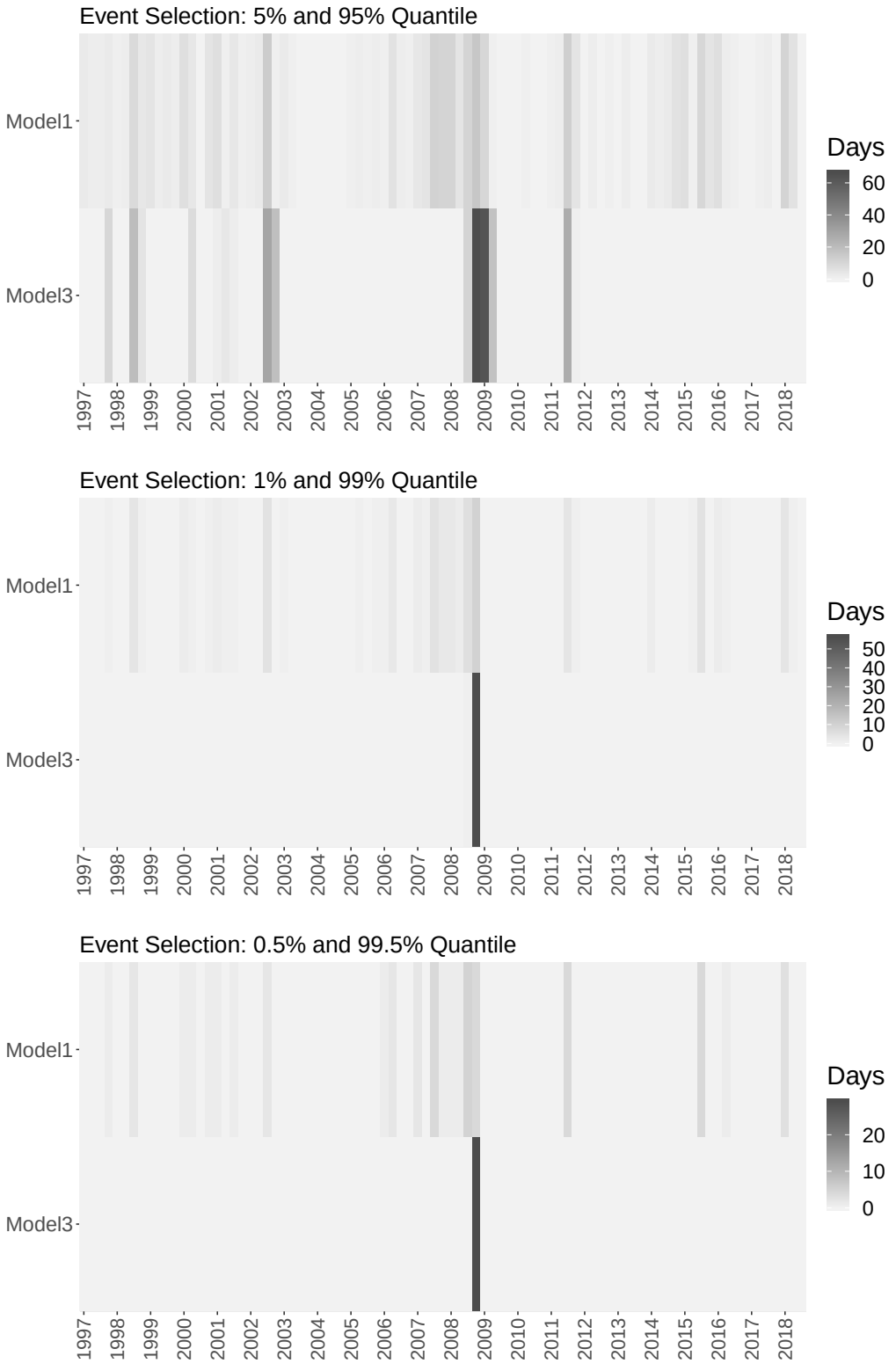

Figure 2: Crisis period definitions for different extreme stock market return thresholds (US)

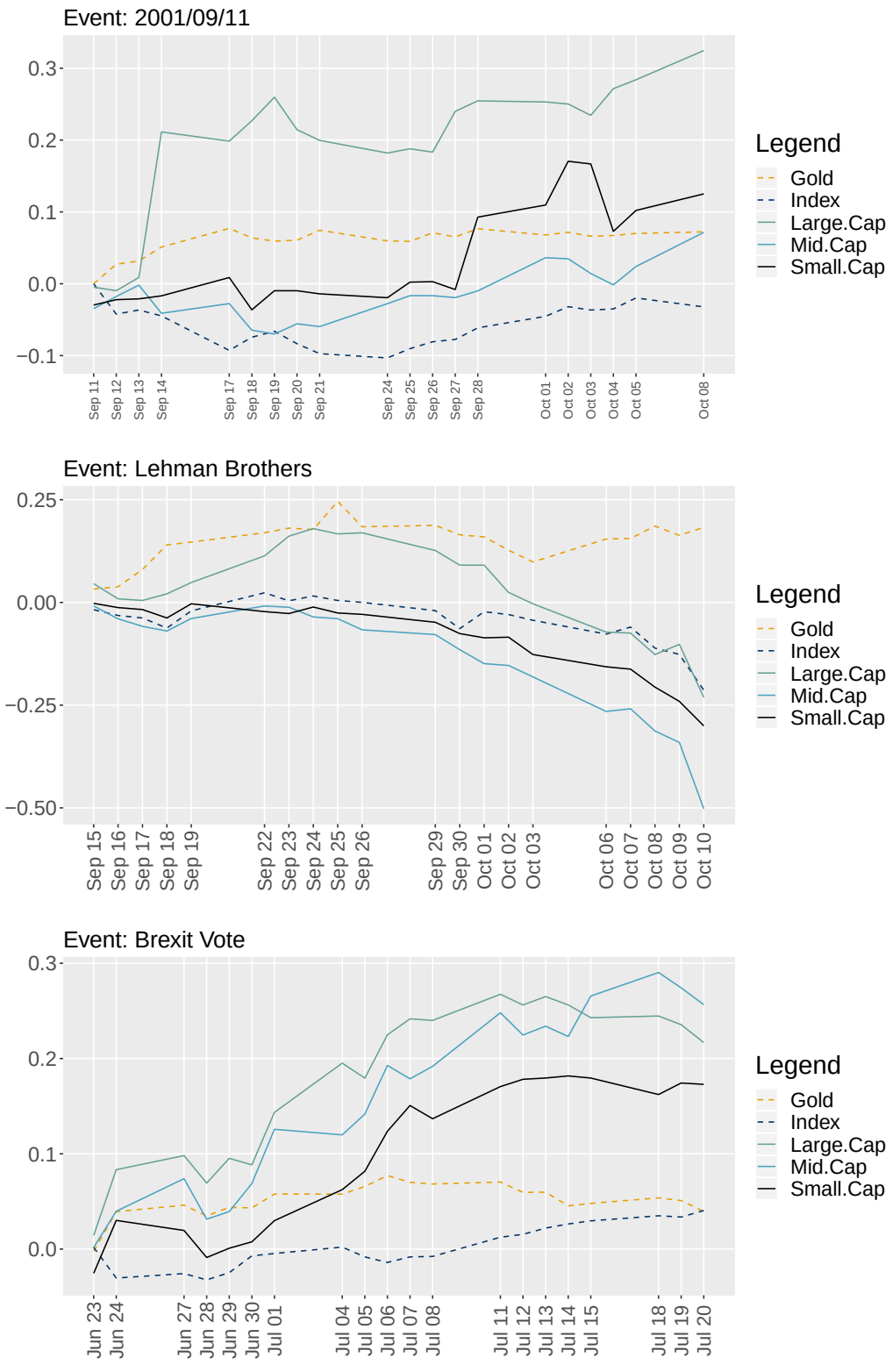

Figure 3: Post-event cumulative returns (Gold vs. AUS-listed gold mining shares vs. ASX 200)

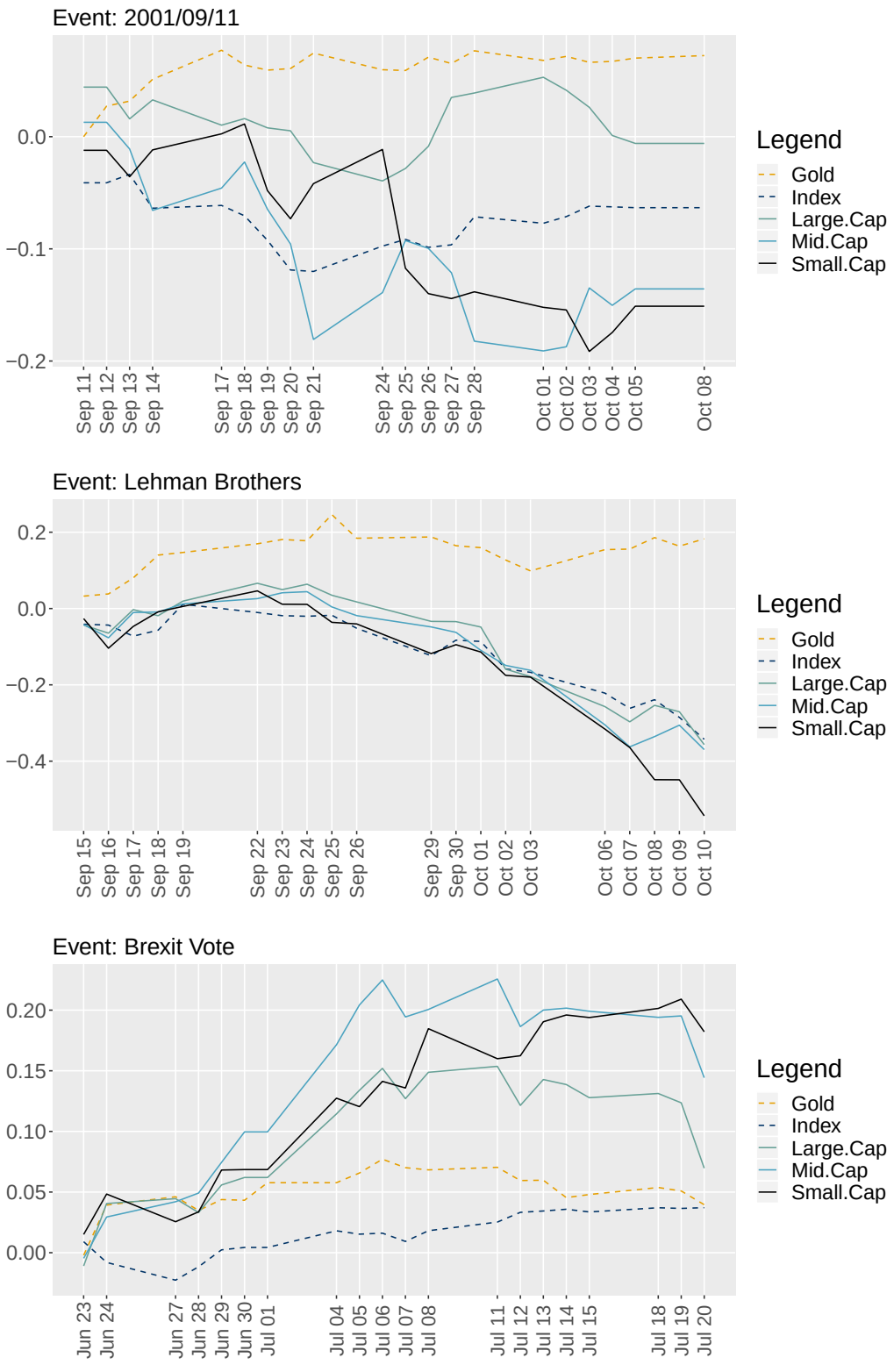

Figure 4: Post-event cumulative returns (Gold vs. CAN-listed gold mining shares vs. TSX Composite)

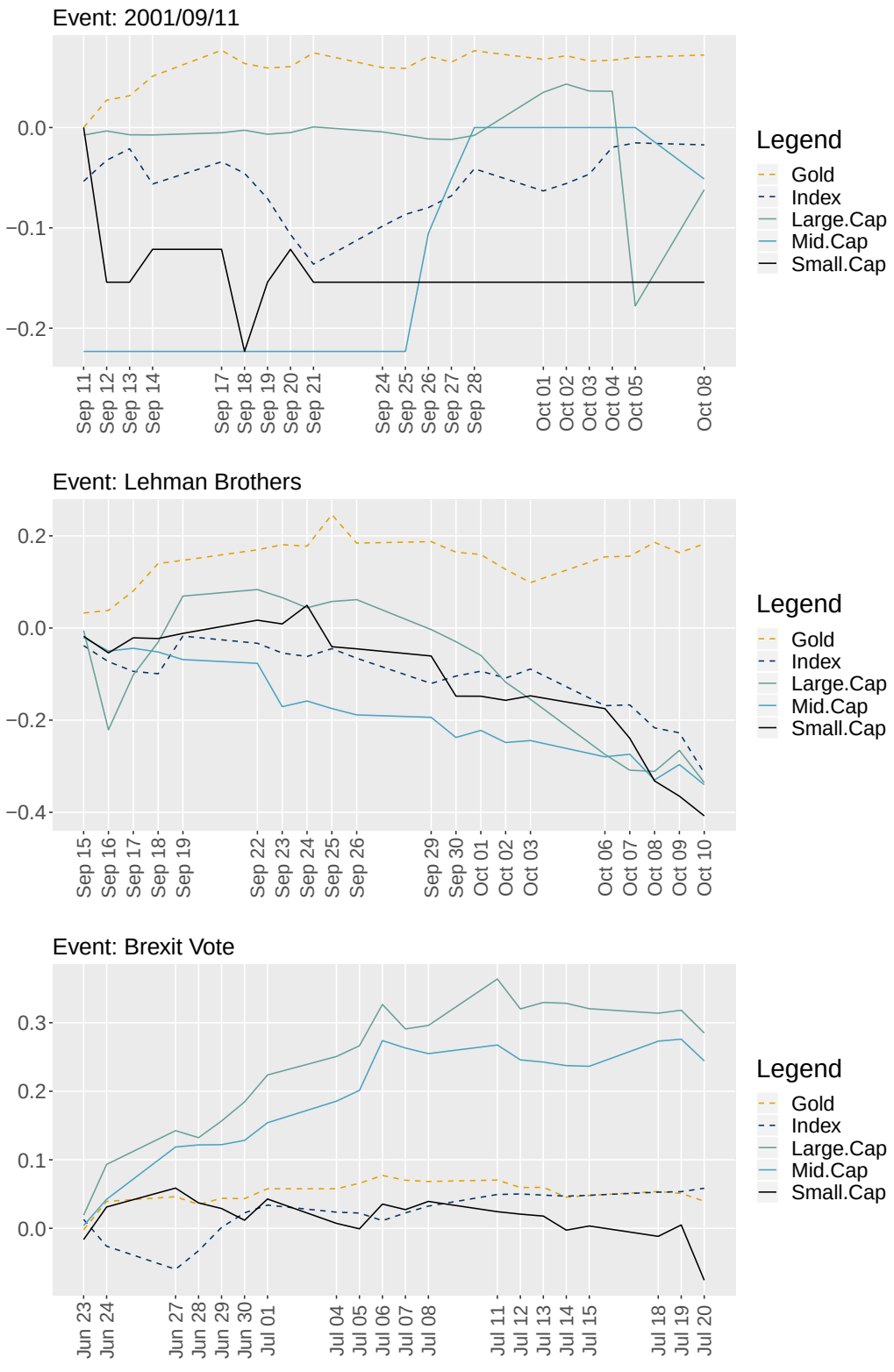

Figure 5: Post-event cumulative returns (Gold vs. UK-listed gold mining shares vs. FTSE All Share)

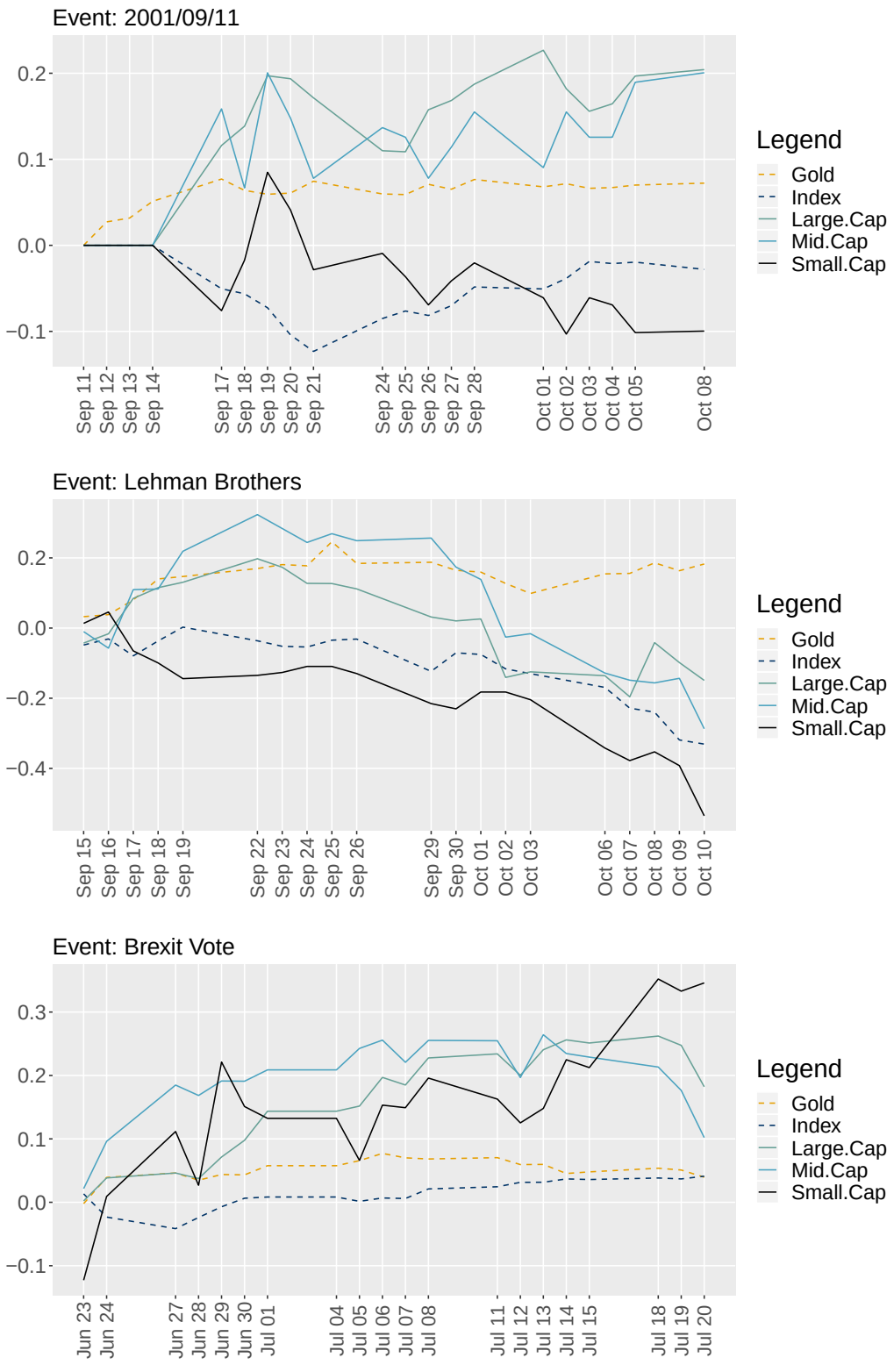

Figure 6: Post-event cumulative returns (Gold vs. US-listed gold mining shares vs. S&P 500)

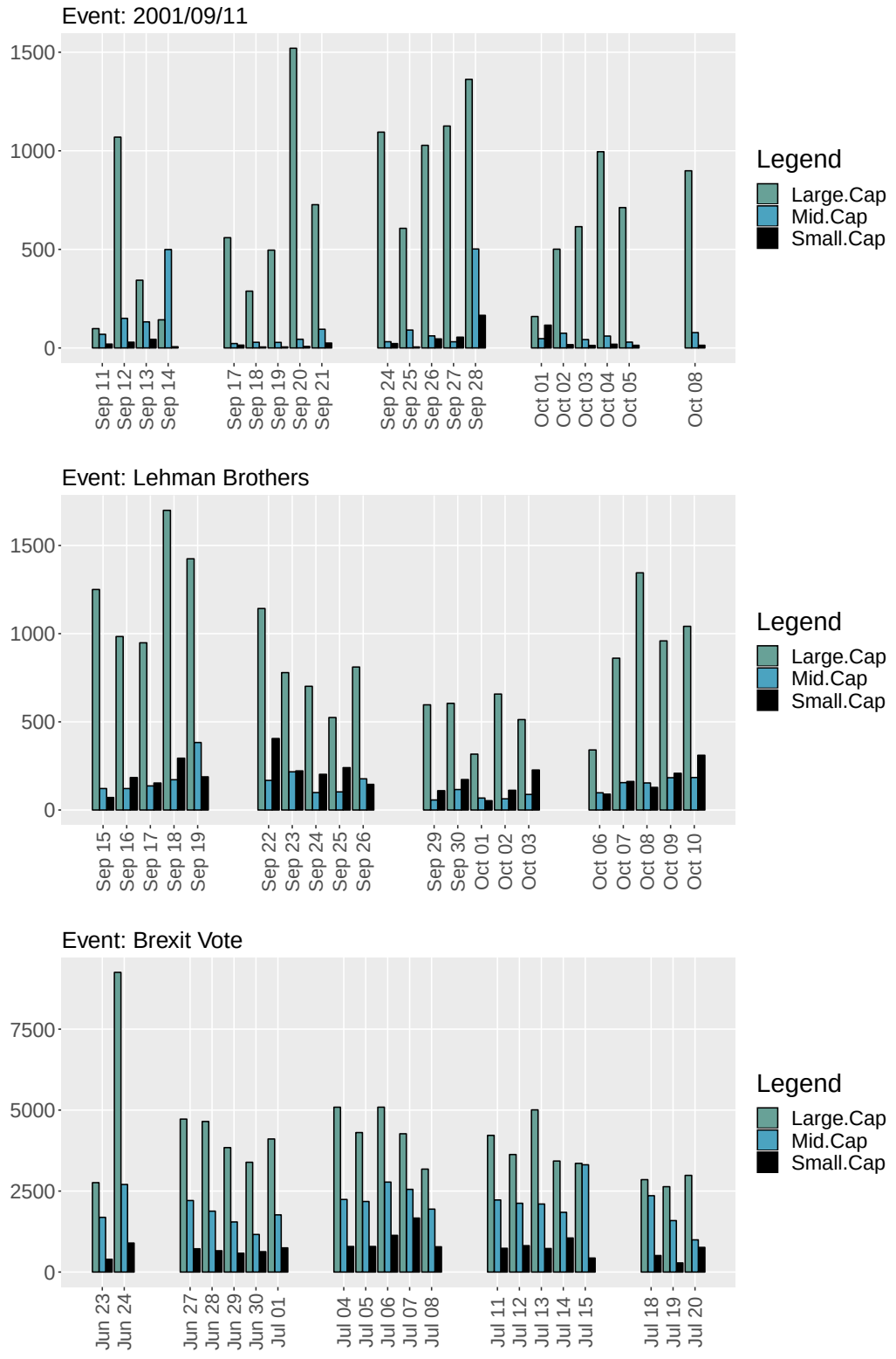

Figure 7: Average trading volume of AUS-listed gold mining shares in post-event periods.

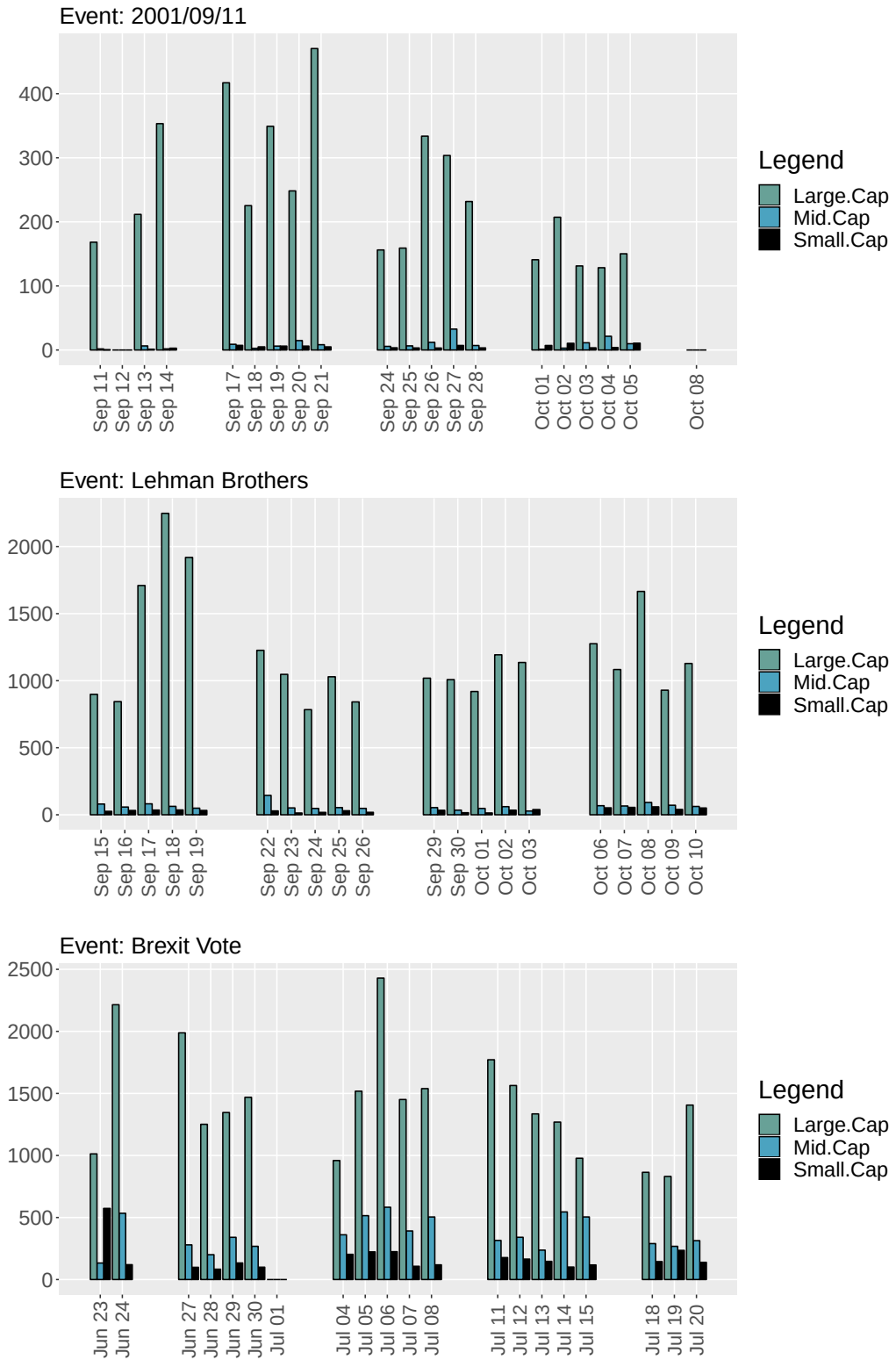

Figure 8: Average trading volume of CAN-listed gold mining shares in post-event periods.

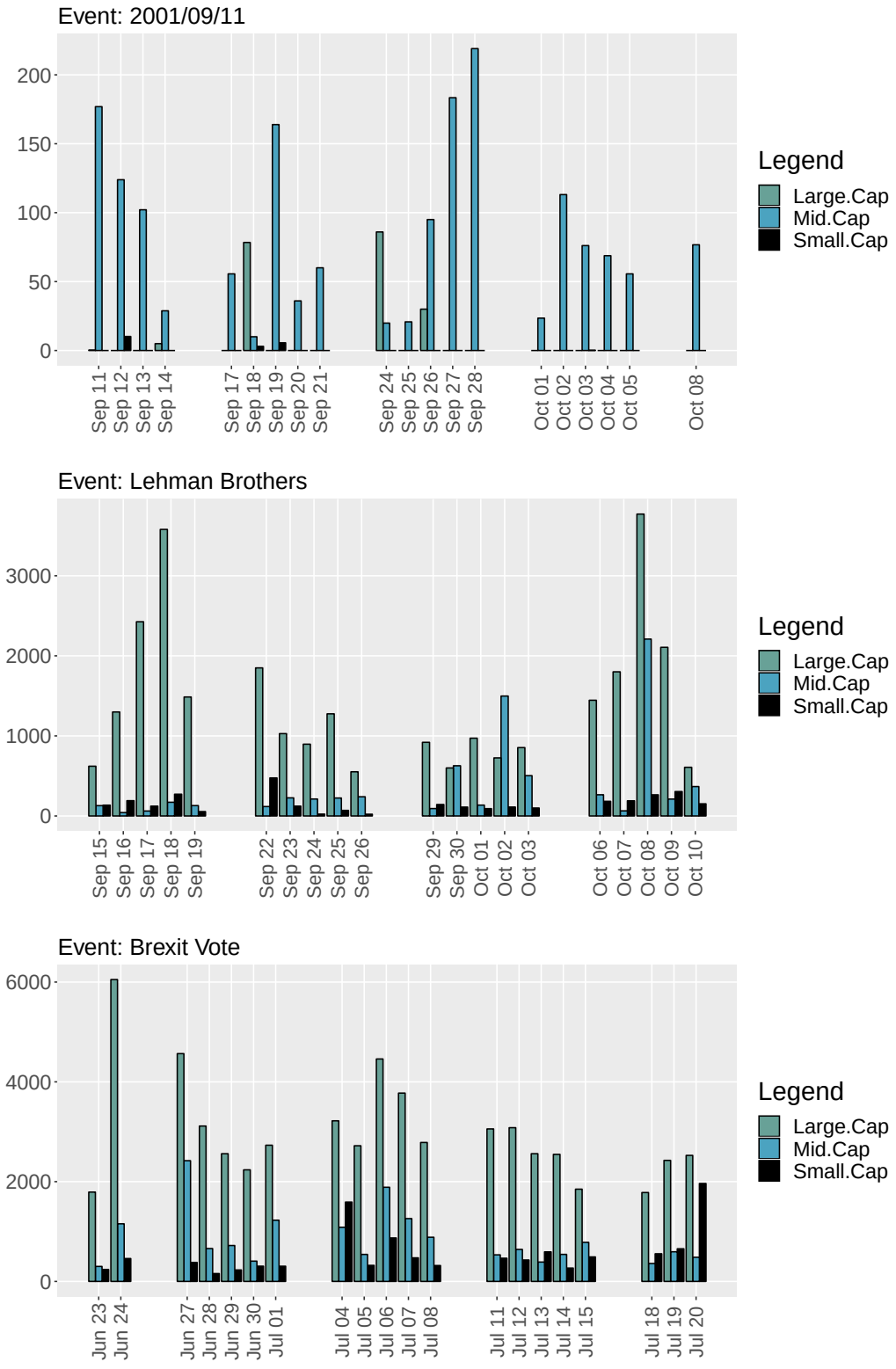

Figure 9: Average trading volume of UK-listed gold mining shares in post-event periods.

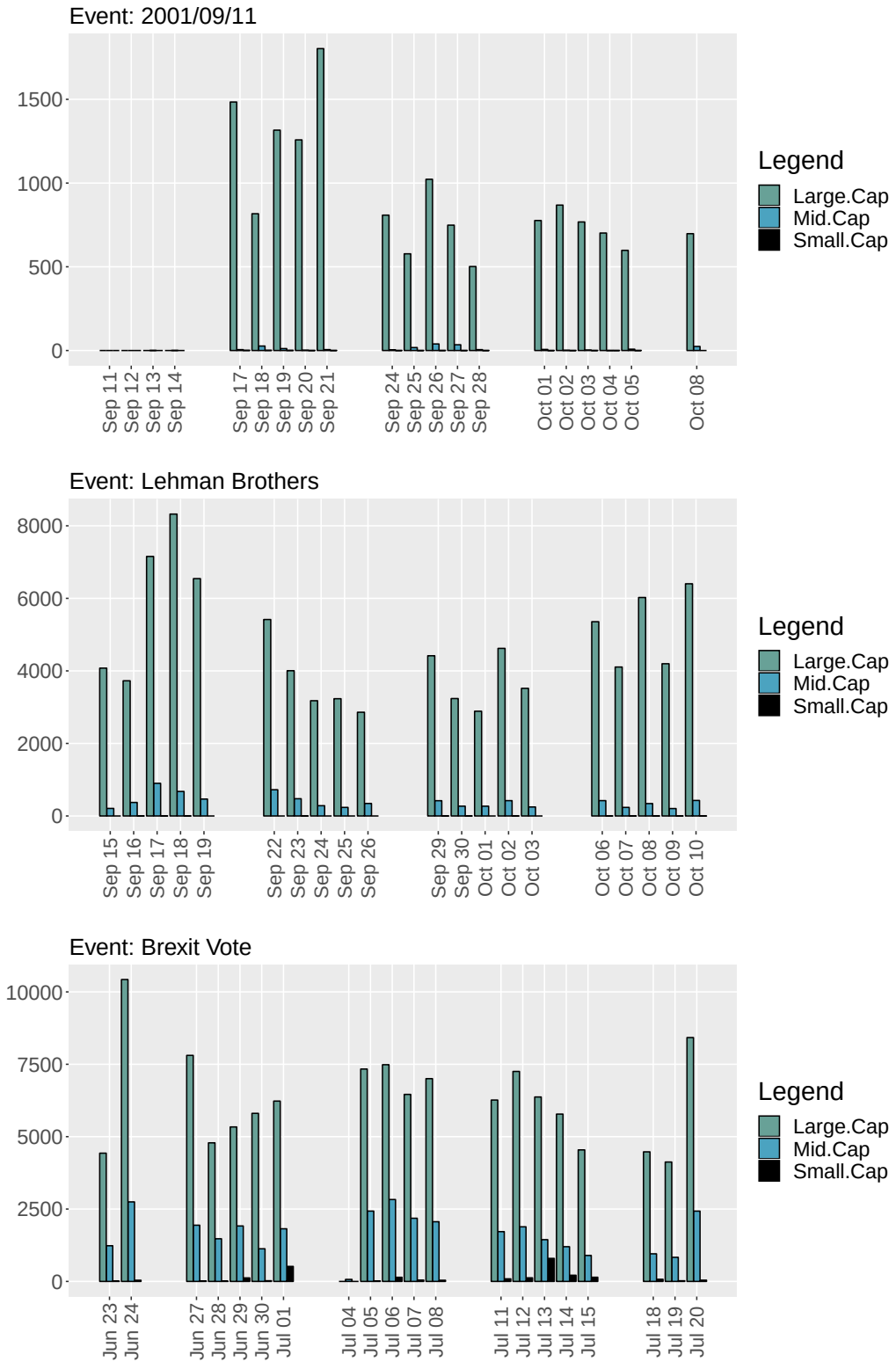

Figure 10: Average trading volume of US-listed gold mining shares in post-event periods.

Table 1: Descriptive statistics (AUS, all)

	Marketcap	Mean	Stdev	Min	Max	Skewness	Kurtosis
Large Cap							
NEWCREST.MINING^{L}	10834.27	0.03	2.63	-18.47	16.91	-0.03	7.00
NORTHERN.STAR	3934.92	0.10	5.14	-48.77	50.83	0.19	16.87
EVOLUTION.MINING	3283.99	0.02	4.71	-46.10	43.99	0.63	14.60
OZ.MINERALS^{L}	2061.87	0.02	3.70	-26.58	38.82	0.59	13.61
INDEPENDENCE.GROUP^{L}	1921.60	0.07	3.31	-17.95	42.38	0.63	11.63
OCEANAGOLD.CDI.^{L}	1785.87	0.00	4.06	-36.08	23.10	-0.15	9.11
REGIS.RESOURCES	1418.80	-0.03	5.22	-75.38	109.86	0.08	75.60
ST.BARBARA	1384.58	-0.00	4.61	-32.22	41.70	0.35	8.31
SANDFIRE.RESOURCES	807.22	0.08	4.93	-51.15	52.84	0.65	20.12
RESOLUTE.MINING^{L}	576.50	-0.04	4.00	-34.51	33.03	0.30	8.11
GOLD.ROAD.RESOURCES	394.33	0.04	5.46	-62.80	62.80	0.56	22.47
DACIAN.GOLD	365.24	0.09	4.07	-29.55	19.68	-0.30	9.49
PERSEUS.MINING^{L}	258.78	0.02	4.41	-42.93	39.21	0.09	10.45
SILVER.LAKE.RESOURCES^{L}	189.59	0.01	4.47	-26.57	23.64	0.21	6.10
RAMELIUS.RESOURCES	183.87	0.03	4.87	-28.35	93.83	2.46	43.50
WEST.AFRICAN.RESOURCES	145.21	0.01	5.20	-25.95	34.83	0.54	7.97
Mid Cap							
GASCOYNE.RESOURCES	117.47	0.02	5.02	-24.78	49.90	0.96	13.59
DORAY.MINERALS^{L}	108.46	0.02	4.36	-30.42	100.33	5.55	128.80
ALKANE.RESOURCES	88.03	-0.01	4.37	-24.51	32.77	0.55	6.68
BEADELL.RESOURCES	63.08	-0.07	5.50	-60.49	49.90	0.21	20.18
DGR.GLOBAL	53.33	-0.01	5.81	-40.55	45.17	0.40	11.17
MEDUSA.MINING^{L}	52.71	0.01	3.84	-18.23	29.38	0.22	7.05
ORION.MINERALS	47.53	-0.15	6.75	-69.31	83.28	0.10	18.77
BLACKHAM.RESOURCES	42.19	-0.04	6.64	-81.57	57.90	0.22	18.57
DE.GREY.MINING	40.75	-0.07	10.49	-69.31	109.86	0.43	30.16
BASSARI.RESOURCES	35.54	-0.08	7.29	-87.42	67.08	0.03	16.97
ARAFURA.RESOURCES	35.07	-0.01	5.08	-45.36	47.46	0.32	9.53
TROY.RESOURCES	34.97	-0.03	3.98	-42.61	29.51	-0.11	11.19
SUMATRA.COPPER...GOLD	33.77	-0.13	6.34	-34.48	40.55	0.35	8.79
KINGSGATE.CONSOLIDATED^{L}	33.62	-0.02	3.97	-38.14	44.63	0.58	15.75
AXIOM.MINING	30.27	-0.12	7.00	-69.31	69.31	-0.21	17.53
KINGSROSE.MINING	30.16	-0.06	4.33	-33.65	35.67	0.20	12.42
Small Cap							
TANAMI.GOLD	29.81	-0.08	5.36	-59.78	56.80	0.33	17.71
TRITON.MINERALS	28.35	-0.07	6.22	-35.97	87.56	2.80	35.20
CHALICE.GOLD.MINES	26.09	-0.00	3.90	-22.26	29.54	0.48	9.08
FOCUS.MINERALS	25.83	-0.08	5.12	-36.29	37.16	0.27	8.85
ORINOCO.GOLD	19.68	-0.09	5.82	-37.45	55.34	0.59	15.07
SIHAYO.GOLD	18.82	-0.08	7.05	-59.47	69.31	0.49	12.60
BARRA.RESOURCES	15.39	-0.04	6.70	-51.08	79.11	0.50	13.76
CITIGOLD	10.91	-0.06	5.46	-48.95	79.49	1.24	20.92
AZUMAH.RESOURCES	10.77	-0.07	5.37	-34.63	44.80	0.42	8.54
INTREPID.MINES	10.29	-0.07	5.62	-79.85	87.55	-1.04	62.52
DRAGON.MINING	9.66	-0.03	5.47	-38.87	55.96	0.35	11.09
AUSTAR.GOLD	6.93	-0.12	8.51	-40.68	98.08	1.23	14.16
KALNORTH.GOLD.MINES	4.54	-0.08	5.87	-45.20	51.08	0.08	19.57
GREAT.WSTN.EXPLORATION	4.00	-0.11	7.58	-74.78	53.90	0.41	14.50
CRATER.GOLD.MINING	3.65	-0.16	10.70	-69.31	69.31	0.18	23.26
BERKUT.MINERALS	3.17	-0.20	6.01	-30.11	40.55	0.13	9.27
METMINCO	2.65	-0.26	7.65	-45.20	51.01	0.23	9.20
Average	624.98	-0.04	5.51	-44.56	54.42	0.52	19.13
Gold		0.02	1.06	-9.60	7.01	-0.19	9.50
Index		0.02	0.96	-8.70	5.72	-0.48	9.11

Note: Market capitalization in Million USD. All remaining figures are computed for percentage returns. Daily data between January 1997 and September 2018 is used. Superscript L indicates stocks of the highly liquid sample.

Table 2: Descriptive statistics (CAN, all)

	Marketcap	Mean	Stdev	Min	Max	Skewness	Kurtosis
Large Cap							
BARRICK.GOLD..TSX.^{L}	12359.42	-0.02	2.58	-17.91	28.11	0.17	9.67
GOLDCORP^{L}	9379.60	0.02	2.80	-22.12	22.56	0.16	8.53
AGNICO.EAGLE.MINES^{L}	8160.14	0.02	3.08	-28.41	21.62	-0.02	9.07
KIRKLAND.LAKE.GOLD	3812.75	-0.04	6.28	-40.38	76.48	0.80	14.24
KINROSS.GOLD^{L}	3766.04	-0.04	3.51	-23.94	24.79	0.28	7.75
B2GOLD^{L}	2214.54	0.01	3.85	-16.71	25.49	0.33	6.03
OCEANAGOLD^{L}	1855.40	0.00	4.26	-25.13	39.30	0.10	10.23
IAMGOLD^{L}	1827.06	-0.00	3.58	-21.68	24.50	0.17	6.35
ALAMOS.GOLD^{L}	1803.46	0.04	3.63	-25.97	30.16	0.07	7.77
ENDEAVOUR.MINING	1727.37	-0.01	4.11	-25.34	25.93	0.03	8.86
DETOUR.GOLD^{L}	1557.07	0.04	3.98	-35.97	25.18	-0.32	10.75
CENTERRA.GOLD^{L}	1239.98	0.00	4.02	-40.10	50.34	-0.21	22.03
OSISKO.GOLD.ROYALTIES^{L}	1185.18	-0.03	2.12	-12.93	12.70	-0.23	7.65
SEMAFO^{L}	794.74	-0.01	5.13	-44.18	33.65	0.06	9.37
ELDORADO.GOLD^{L}	754.33	-0.04	4.25	-32.63	47.69	0.36	11.00
FORTUNA.SILVER.MINES	713.67	0.07	4.09	-30.54	79.11	1.63	37.87
TOREX.GOLD.RESOURCES	712.91	0.00	7.92	-47.00	76.55	0.57	11.93
NEW.GOLD^{L}	643.70	0.02	5.22	-55.96	60.61	0.16	21.97
CHINA.GOLD.INT.RES.^{L}	597.06	0.07	5.21	-34.69	91.63	1.89	29.84
ALACER.GOLD^{L}	490.22	0.02	4.18	-21.02	56.10	0.93	15.84
CONTINENTAL.GOLD	484.71	-0.04	8.96	-73.40	139.95	1.47	35.08
GOLD.STANDARD.VENTURES	441.48	-0.06	6.21	-82.67	69.31	0.25	30.28
DUNDEE.PRCS.MTLS.^{L}	405.37	-0.00	3.03	-24.54	20.54	0.06	8.90
OSISKO.MINING	388.83	-0.17	6.39	-51.12	38.30	-0.84	17.25
WESDOME.GOLD.MINES	368.93	-0.01	4.45	-26.93	40.10	0.48	8.38
TERANGA.GOLD^{L}	342.37	-0.06	3.64	-17.44	27.63	0.16	6.44
TMAC.RESOURCES^{L}	311.10	-0.03	3.11	-18.07	17.02	0.03	8.79
ATLANTIC.GOLD	296.01	-0.00	5.24	-48.10	38.30	0.15	10.06
GOLDEN.STAR.RESOURCES^{L}	285.32	-0.05	5.39	-42.69	42.59	0.36	9.04
CORVUS.GOLD^{L}	264.41	0.09	5.07	-26.63	43.40	0.64	7.84
ROXGOLD	253.58	-0.06	9.99	-98.08	99.33	0.31	20.34
GOLD.RESERVE.A^{L}	253.34	-0.02	4.95	-48.40	52.41	0.51	15.08
Mid Cap							
SABINA.GOLD...SILVER	247.61	0.03	6.95	-77.32	102.96	0.88	52.20
ARGONAUT.GOLD	245.82	-0.06	5.37	-95.55	135.81	3.64	196.77
VICTORIA.GOLD	197.97	-0.02	7.82	-55.96	85.57	0.85	18.33
GREAT.PANTHER.SILVER	156.67	-0.05	6.40	-51.08	109.86	1.19	32.58
MIDAS.GOLD	154.07	-0.07	3.96	-14.75	20.48	0.42	5.01
BARKERVILLE.GOLD.MINES	135.88	-0.09	7.66	-76.10	65.06	0.11	10.38
LYDIAN.INTERNATIONAL	119.52	-0.00	6.58	-91.63	156.06	5.56	149.13
OREZONE.GOLD^{L}	103.65	0.01	5.18	-50.00	41.69	0.19	11.46
GOLDMINING	88.73	-0.01	4.02	-33.65	34.74	0.35	11.43
BONTERRA.RESOURCES	86.75	-0.08	10.16	-69.31	69.31	0.14	25.39
BELO.SUN.MINING	85.47	0.00	8.48	-55.96	91.63	0.59	14.78
INTL.TWR.HILL.MNS.	80.81	-0.02	5.20	-78.41	105.46	0.77	52.07
RUPERT.RES.	80.20	-0.01	8.71	-76.21	91.63	0.43	12.39
CALEDONIA.MINING.CORP.	71.50	-0.05	7.08	-36.30	69.53	0.69	10.86
ALMADEN.MINERALS	68.12	-0.01	5.36	-55.96	39.02	0.14	12.93
AURA.MINERALS	63.65	-0.08	6.06	-70.77	51.99	-0.05	17.47
CHESAPEAKE.GOLD^{L}	62.66	0.00	3.57	-31.73	27.81	0.36	10.24
ALIO.GOLD^{L}	59.54	-0.05	4.90	-31.47	35.67	0.35	9.43
BARSELE.MINERALS	56.65	0.16	6.50	-51.08	31.02	-0.21	12.56
LIBERTY.GOLD	54.38	-0.11	4.09	-15.86	24.12	0.56	5.81
ROBEX.RESOURCES	51.47	-0.05	8.20	-61.90	69.31	0.37	9.18
DYNACOR.GOLD.MINES	49.67	0.03	5.59	-41.36	49.64	0.69	13.90
METANOR.RESOURCES	48.03	-0.08	5.28	-34.65	36.77	0.27	7.45
AVINO.SILVER...GD.MINES	47.84	-0.01	7.25	-49.06	81.83	0.52	13.54
TANZANIAN.RTY.EXP..A.^{L}	46.10	-0.01	5.94	-41.06	62.25	0.45	11.98
GOGOLD.RESOURCES	43.24	0.01	3.82	-31.02	41.87	0.60	17.55

GOLDEN.QUEEN.MNG.	39.41	-0.05	7.88	-51.08	96.14	0.49	14.95
TERRAX.MINERALS	36.01	0.00	7.82	-69.31	91.63	0.82	24.92
KERR.MINES	34.57	-0.11	8.74	-69.31	69.31	0.27	11.19
MAWSON.RES.	34.45	-0.03	6.97	-47.00	71.91	0.79	11.85
COLUMBUS.GOLD	33.72	-0.04	6.44	-65.39	62.42	0.75	17.06
Small Cap							
TREASURY.METALS	33.27	-0.06	6.95	-47.96	69.31	0.36	16.47
FORTUNE.MINERALS	31.38	-0.08	6.41	-51.08	69.31	0.31	17.54
RED.EAGLE.MINING	30.89	-0.13	6.10	-38.30	51.08	0.18	10.21
EURO.SUN.MINING	30.69	-0.04	10.66	-69.31	109.86	0.31	21.33
ATICO.MINING	30.43	-0.02	4.90	-29.95	36.42	0.51	8.38
AMARILLO.GOLD	24.75	-0.04	8.60	-98.08	69.31	0.13	14.70
ESKAY.MINING	23.41	-0.03	10.30	-58.78	69.31	0.34	8.27
IDM.MINING	22.55	-0.17	6.84	-40.55	91.63	1.14	21.41
AXMIN	20.16	-0.05	10.74	-69.31	69.31	0.22	23.74
SIRIOS.RES.	18.42	-0.05	9.69	-89.20	102.40	0.69	15.51
PUDO	17.23	0.06	10.53	-87.55	87.55	0.17	19.82
ATLATSA.RESOURCES	17.13	-0.08	7.29	-69.31	69.31	0.37	17.55
MARLIN.GOLD.MINING.A	16.57	-0.10	6.90	-43.24	60.22	0.56	11.78
ORVANA.MINERALS	15.83	-0.07	6.07	-49.25	60.61	0.29	14.55
LUPAKA.GOLD	15.07	-0.09	7.29	-35.67	38.30	0.30	5.77
OROSUR.MINING	13.62	-0.03	6.25	-81.09	84.73	0.19	29.79
CORAL.GOLD.RESOURCES	13.37	-0.06	7.63	-42.29	71.02	0.60	9.54
STRIKEPOINT.GOLD	12.30	-0.04	9.89	-69.31	91.63	0.36	11.63
MUNDORO.CAPITAL	9.37	-0.07	6.03	-57.54	61.90	0.27	15.91
FREEGOLD.VENTURES	8.74	-0.10	8.12	-47.00	58.78	0.28	7.83
COLORADO.RESOURCES	8.17	-0.09	7.41	-48.73	121.64	2.17	42.14
MINERAL.MOUNTAIN.RES.	7.89	-0.11	8.02	-45.68	40.55	-0.01	6.08
CANARC.RESOURCE	5.91	-0.07	8.24	-69.31	51.08	0.13	9.08
INTERNATIONAL.GOLD.AND.METALS	5.48	-0.10	10.56	-69.31	84.87	0.17	13.38
EAGLE.GRAPHITE	4.39	-0.14	10.20	-91.63	79.85	-0.02	14.74
MINCO.GOLD	3.92	-0.06	6.82	-62.42	81.09	0.48	13.90
PELANGIO.EXPLORATION	3.07	-0.08	8.40	-36.77	61.90	0.37	7.70
DYNASTY.GOLD	2.47	-0.12	12.54	-69.31	138.63	0.26	15.27
ATLANTA.GOLD	2.36	-0.14	8.96	-69.31	69.31	0.03	18.79
MIRANDA.GD.	1.54	-0.09	7.58	-76.21	47.00	-0.11	12.06
COLOMBIA.CREST.GOLD	0.52	-0.14	10.68	-69.31	109.86	0.29	18.39
INFINITO.GOLD	0.48	-0.11	8.97	-69.31	69.31	-0.20	20.01
Average	661.32	-0.04	6.46	-50.45	62.96	0.47	18.55
Gold		0.02	1.06	-9.60	7.01	-0.19	9.50
Index		0.02	1.06	-9.79	9.37	-0.70	12.85

Note: Market capitalization in Million USD. All remaining figures are computed for percentage returns. Daily data between January 1997 and September 2018 is used. Superscript L indicates stocks of the highly liquid sample.

Table 3: Descriptive statistics (UK, all)

	Marketcap	Mean	Stdev	Min	Max	Skewness	Kurtosis
Large Cap							
RANDGOLD.RESOURCES^L	6012.35	0.04	2.79	-56.56	30.51	-1.42	43.68
POLYMETAL.INTERNATIONAL^L	3735.32	-0.02	2.36	-20.30	11.30	-0.50	8.93
CENTAMIN	1478.85	0.06	3.26	-64.32	22.36	-2.10	49.44
HOCHSCHILD.MINING^L	1073.48	-0.02	3.54	-26.20	22.43	0.13	8.39
HIGHLAND.GOLD.MINING^L	606.71	-0.01	3.84	-84.60	47.91	-2.20	69.97
ACACIA.MINING^L	578.50	-0.08	3.28	-35.23	15.86	-1.21	15.05
PETROPAVLOVSK^L	277.09	-0.05	3.68	-35.19	53.74	0.37	22.87
Mid Cap							
GRIFFIN.MINING	214.56	0.02	3.90	-35.14	78.28	2.70	58.73
AVESORO.RESOURCES..DI.	204.88	-0.21	4.07	-62.86	28.77	-2.13	44.75
HUMMINGBIRD.RESOURCES	126.40	-0.09	2.81	-23.27	22.12	0.91	14.73
CHAARAT.GOLD.HDG..DI.	118.33	-0.03	3.97	-92.46	42.65	-3.39	115.86
ANGLO.ASIAN.MINING	88.93	-0.01	5.31	-41.55	53.29	0.55	13.68
SHANTA.GOLD	51.34	-0.05	4.27	-74.19	77.65	0.78	81.80
Small Cap							
CONDOR.GOLD	31.88	-0.05	5.92	-57.05	69.31	1.46	25.76
ALTYN	29.62	-0.04	4.03	-33.94	39.05	0.61	14.98
CHINA.NONFERROUS.GD.	22.64	-0.02	3.62	-22.31	38.87	1.46	18.93
PATAGONIA.GOLD	21.81	-0.04	4.25	-46.61	34.18	0.62	14.04
XTRACT.RESOURCES	4.73	-0.17	6.71	-57.54	92.68	1.32	29.21
ECR.MINERALS	3.27	-0.27	5.90	-80.18	69.31	0.33	28.84
AVOCET.MINING	3.10	-0.09	4.19	-72.27	38.81	-0.52	36.26
Average	734.19	-0.06	4.09	-51.09	44.45	-0.11	35.79
Gold		0.02	1.06	-9.60	7.01	-0.19	9.50
Index		0.01	1.09	-8.71	8.81	-0.22	9.15

Note: Market capitalization in Million USD. All remaining figures are computed for percentage returns. Daily data between January 1997 and September 2018 is used. Superscript L indicates stocks of the highly liquid sample.

Table 4: Descriptive statistics (US, all)

	Marketcap	Mean	Stdev	Min	Max	Skewness	Kurtosis
Large Cap							
NEWMONT.MINING^L	16812.73	-0.01	2.69	-18.26	22.45	0.34	8.24
ROYAL.GOLD^L	5149.14	0.03	3.27	-39.52	26.46	-0.05	11.16
HECLA.MINING^L	1450.12	-0.01	4.40	-35.12	31.67	0.07	8.76
COEUR.MINING^L	1069.99	-0.06	4.53	-40.55	33.78	-0.11	10.25
Mid Cap							
MCEWEN.MINING^L	654.30	0.01	6.00	-58.82	73.08	0.66	15.23
VISTA.GOLD..ASE.^{L}	48.79	-0.06	7.64	-84.73	102.96	0.44	20.65
PERSHING.GOLD	35.65	-0.06	5.19	-79.85	65.94	0.40	59.34
Small Cap							
US.GOLD^L	18.33	-0.09	4.85	-41.29	46.43	0.55	13.18
BULLFROG.GOLD	8.11	-0.11	10.70	-91.63	82.10	0.11	10.93
LONE.STAR.GOLD	0.72	-0.02	17.37	-73.09	476.12	10.13	278.06
BONANZA.GOLDFIELDS	0.65	-0.26	16.23	-69.31	138.63	0.77	13.20
Average	2295.32	-0.06	7.53	-57.47	99.97	1.21	40.82
Gold		0.02	1.06	-9.60	7.01	-0.19	9.50
Index		0.02	1.18	-9.47	10.96	-0.25	11.45

Note: Market capitalization in Million USD. All remaining figures are computed for percentage returns. Daily data between January 1997 and September 2018 is used. Superscript L indicates stocks of the highly liquid sample.

Table 5: Market betas and gold betas per market

	$\hat{\beta}_M$	$sd(\hat{\beta}_M)$	$\hat{\beta}_G$	$sd(\hat{\beta}_G)$
Panel A: full sample				
AUS	0.66	0.26	0.35	0.26
CAN	0.60	0.27	0.64	0.26
UK	0.32	0.35	0.66	0.47
US	0.32	0.35	0.66	0.47
Panel B: sub-sample (liquid gold mining shares)				
AUS	0.83	0.30	0.63	0.21
CAN	0.76	0.20	0.86	0.16
UK	0.76	0.22	0.98	0.16
US	0.50	0.21	0.90	0.41

Note: $\hat{\beta}_M$ and $\hat{\beta}_G$ denote the average market beta and gold beta across all gold mining companies, respectively. $sd(\cdot)$ denotes the estimated (cross-sectional) standard deviation.

Table 6: Gold beta estimates sorted by market cap (AUS, Liquid)

	Specification 1		Specification 2				Specification 3	
	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$	$\hat{\delta}_1$	$\hat{\delta}_2$
NEWCREST.MINING	0.66***	0.38***	0.71***	-0.34	-0.50***	1.15**	0.74***	-0.27***
OZ.MINERALS	0.35***	0.29*	0.40***	-3.06***	-0.10	-0.23	0.39***	-0.07
INDEPENDENCE.GROUP	0.35***	0.18	0.38***		-0.28	0.50	0.40***	-0.15
OCEANAGOLD.CDI.	0.80***	0.42*	0.88***		-0.97***	1.03	0.98***	-0.49***
RESOLUTE.MINING	0.96***	-0.09	0.97***	-0.49	-0.63**	1.89***	1.06***	-0.59***
PERSEUS.MINING	0.76***	-0.08	0.80***		-1.29***	1.78**	0.88***	-0.55***
SILVER.LAKE.RESOURCES	0.93***	-0.46*	0.92***		-0.65**	1.27	1.08***	-0.64***
DORAY.MINERALS	0.71***	-0.08	0.69***			0.85	0.67***	0.28
MEDUSA.MINING	0.59***	0.18	0.63***		-0.48*	0.91	0.65***	-0.17
KINGSGATE.CONSOLIDATED	0.63***	0.08	0.67***	-1.22*	-0.67**	-0.66	0.65***	-0.09
	Summary of estimated coefficients							
Number of Obs.	10.00	10.00	10.00	4.00	9.00	10.00	10.00	10.00
Mean	0.67	0.08	0.70	-1.28	-0.62	0.85	0.75	-0.27
Median	0.68	0.13	0.70	-0.85	-0.63	0.97	0.71	-0.22
Minimum	0.35	-0.46	0.38	-3.06	-1.29	-0.66	0.39	-0.64
Maximum	0.96	0.42	0.97	-0.34	-0.10	1.89	1.08	0.28
25% Quantile	0.60	-0.08	0.64	-1.68	-0.67	0.59	0.65	-0.54
75% Quantile	0.79	0.26	0.86	-0.45	-0.48	1.24	0.95	-0.10

Note: Gold beta estimates of Liquid AUS-listed mining stocks. In Tab. (6), $\hat{\beta}_1$ and $\hat{\beta}_2$ are the estimated coefficients of model 1 during the full sample period and crisis events in a rolling .25% quantile threshold, respectively. $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ are the estimated coefficients of model 2, and $\hat{\delta}_1$ and $\hat{\delta}_2$ are based on model 3. ***, **, * denote statistical significance at the 1%, 5% and 10% level.

Table 7: Gold beta estimates sorted by market cap (CAN, Liquid)

	Specification 1		Specification 2				Specification 3	
	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$	$\hat{\delta}_1$	$\hat{\delta}_2$
BARRICK.GOLD..TSX.	0.77***	0.40***	0.85***	-0.87*	-0.82***	1.19***	0.81***	0.09
GOLDCORP	0.86***	0.26***	0.92***	-1.27**	-0.80***	0.55	0.87***	0.12
AGNICO.EAGLE.MINES	0.88***	0.30***	0.95***	-0.36	-0.78***	0.58	0.93***	-0.02
KINROSS.GOLD	1.02***	0.18	1.07***	-0.25	-0.77***	0.96	1.05***	-0.07
B2GOLD	0.90***	0.07	0.96***		-1.13***	1.94***	1.05***	-0.58***
OCEANAGOLD	1.00***	0.75***	1.13***		-0.76***	0.57	1.17***	-0.36**
IAMGOLD	1.02***	0.10	1.07***	-1.01	-1.07***	1.07*	1.03***	0.02
ALAMOS.GOLD	0.86***	0.25*	0.93***		-0.91***	1.23*	0.99***	-0.54***
DETOUR.GOLD	1.25***	0.55***	1.39***		-1.30***	0.56	1.29***	0.15
CENTERRA.GOLD	0.85***	0.49***	0.99***		-1.51***	-0.05	0.92***	0.02
OSISKO.GOLD.ROYALTIES	0.75***	0.05	0.75***			0.16	0.76***	
SEMAFO	0.97***	0.27	1.05***	-2.86***	-1.03***	1.34	1.06***	-0.30*
ELDORADO.GOLD	1.07***	0.26*	1.13***	1.55**	-0.83***	0.83	1.11***	0.00
NEW.GOLD	0.79***	0.33*	0.86***	-1.07	-0.69**	1.25	0.78***	0.35**
CHINA.GOLD.INT.RES.	0.81***	0.10	0.84***	-0.85	-0.27	0.85	0.79***	0.21
ALACER.GOLD	0.84***	0.34**	0.95***		-1.34***	0.19	0.90***	-0.05
DUNDEE.PRCS.MTLS.	0.76***	0.06	0.80***	-0.12	-0.93***	-0.34	0.81***	-0.26***
TERANGA.GOLD	0.78***	0.79***	0.87***			0.82	0.89***	0.07
TMAC.RESOURCES	0.80***	-0.55	0.76***			-0.36	0.74***	
GOLDEN.STAR.RESOURCES	1.19***	0.54***	1.29***	0.08	-0.88**	0.29	1.25***	0.10
CORVUS.GOLD	0.90***	0.90***	1.02***			-0.16	1.03***	-1.68
GOLD.RESERVE.A	0.71***	-0.16	0.75***	-2.29**	-1.09***	-2.27**	0.62***	0.47***
OREZONE.GOLD	1.12***	0.18	1.15***			-0.68	1.13***	0.12
CHESAPEAKE.GOLD	0.57***	-0.17	0.56***		-0.81***	2.34***	0.58***	-0.21
ALIO.GOLD	0.94***	0.36*	1.06***		-1.32***	1.78**	1.16***	-0.72***
TANZANIAN.RTY.EXP..A.	0.72***	0.30	0.79***	-1.93*	-0.60	0.47	0.78***	-0.12
			Summary of estimated coefficients					
Number of Obs.	26.00	26.00	26.00	13.00	21.00	26.00	26.00	24.00
Mean	0.89	0.27	0.96	-0.86	-0.94	0.58	0.94	-0.13
Median	0.86	0.27	0.95	-0.87	-0.88	0.58	0.92	-0.01
Minimum	0.57	-0.55	0.56	-2.86	-1.51	-2.27	0.58	-1.68
Maximum	1.25	0.90	1.39	1.55	-0.27	2.34	1.29	0.47
25% Quantile	0.78	0.10	0.84	-1.27	-1.09	0.17	0.79	-0.27
75% Quantile	0.99	0.39	1.06	-0.25	-0.78	1.16	1.06	0.10

Note: Gold beta estimates of Liquid CAN-listed mining stocks. In Tab. (7), $\hat{\beta}_1$ and $\hat{\beta}_2$ are the estimated coefficients of model 1 during the full sample period and crisis events in a rolling .25% quantile threshold, respectively. $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ are the estimated coefficients of model 2, and $\hat{\delta_1}$ and $\hat{\delta_2}$ are based on model 3. ***, **, * denote statistical significance at the 1%, 5% and 10% level.

Table 8: Gold beta estimates sorted by market cap (UK, Liquid)

	Specification 1		Specification 2				Specification 3	
	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$	$\hat{\delta}_1$	$\hat{\delta}_2$
RANDGOLD.RESOURCES	1.04***	0.28***	1.09***	-1.22**	-0.56***	1.88***	1.07***	0.00
POLYMETAL.INTERNATIONAL	0.93***	-0.01	0.92***			0.57	0.93***	-0.39
HOCHSCHILD.MINING	1.02***	-0.45***	1.01***		-0.76***	1.22**	1.08***	-0.44***
HIGHLAND.GOLD.MINING	0.73***	0.54***	0.79***		-0.06	0.68	0.84***	-0.21
ACACIA.MINING	1.27***	-0.01	1.23***			2.33***	1.29***	-0.27
PETROPAVLOVSK	1.02***	-0.28*	1.05***		-1.32***	-0.98	1.01***	-0.15
			Summary of estimated coefficients					
Number of Obs.	6.00	6.00	6.00	1.00	4.00	6.00	6.00	6.00
Mean	1.00	0.01	1.01	-1.22	-0.67	0.95	1.04	-0.24
Median	1.02	-0.01	1.03	-1.22	-0.66	0.95	1.04	-0.24
Minimum	0.73	-0.45	0.79	-1.22	-1.32	-0.98	0.84	-0.44
Maximum	1.27	0.54	1.23	-1.22	-0.06	2.33	1.29	-0.00
25% Quantile	0.95	-0.21	0.94	-1.22	-0.90	0.59	0.95	-0.36
75% Quantile	1.04	0.21	1.08	-1.22	-0.43	1.72	1.08	-0.17

Note: Gold beta estimates of Liquid UK-listed mining stocks. In Tab. (8), $\hat{\beta}_1$ and $\hat{\beta}_2$ are the estimated coefficients of model 1 during the full sample period and crisis events in a rolling .25% quantile threshold, respectively. $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ are the estimated coefficients of model 2, and $\hat{\delta_1}$ and $\hat{\delta_2}$ are based on model 3. ***, **, * denote statistical significance at the 1%, 5% and 10% level.

Table 9: Gold beta estimates sorted by market cap (US, Liquid)

	Specification 1		Specification 2				Specification 3	
	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\gamma}_1$	$\hat{\gamma}_2$	$\hat{\gamma}_3$	$\hat{\gamma}_4$	$\hat{\delta}_1$	$\hat{\delta}_2$
NEWMONT.MINING	0.75***	0.25**	0.80***	-0.32	-0.65***	0.53	0.80***	-0.13
ROYAL.GOLD	0.83***	0.22*	0.87***	0.39	-0.40*	0.33	0.87***	-0.07
HECLA.MINING	1.11***	0.24	1.14***	0.73	-0.23	0.19	1.10***	0.22
COEUR.MINING	1.07***	0.19	1.08***	0.32	0.25	0.78	1.03***	0.36**
MCEWEN.MINING	1.17***	-0.17	1.17***	-1.02	-0.76*	1.49	1.16***	-0.05
VISTA.GOLD..ASE.	1.14***	-0.03	1.14***	1.30	-0.68	2.80**	1.07***	0.38
US.GOLD	0.06	-0.26	0.05	-1.76*	-0.62*	1.33	0.11	-0.46***
Summary of estimated coefficients								
Number of Obs.	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Mean	0.87	0.06	0.89	-0.05	-0.44	1.06	0.88	0.04
Median	1.07	0.19	1.08	0.32	-0.62	0.78	1.03	-0.05
Minimum	0.06	-0.26	0.05	-1.76	-0.76	0.19	0.11	-0.46
Maximum	1.17	0.25	1.17	1.30	0.25	2.80	1.16	0.38
25% Quantile	0.79	-0.10	0.83	-0.67	-0.67	0.43	0.83	-0.10
75% Quantile	1.12	0.23	1.14	0.56	-0.31	1.41	1.08	0.29

Note: Gold beta estimates of Liquid US-listed mining stocks. In Tab. (9), $\hat{\beta}_1$ and $\hat{\beta}_2$ are the estimated coefficients of model 1 during the full sample period and crisis events in a rolling .25% quantile threshold, respectively. $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$ and $\hat{\gamma}_4$ are the estimated coefficients of model 2, and $\hat{\delta_1}$ and $\hat{\delta_2}$ are based on model 3. ***, **, * denote statistical significance at the 1%, 5% and 10% level.

Table 10: Cumulative Returns (Liquid)

Event	9/11				Lehman Brothers				Brexit			
Holding period	5	10	15	20	5	10	15	20	5	10	15	20
AUS												
					Sub-categorization by market capitalization							
Gold	7.71	5.97	6.80	7.23	14.69	18.42	9.86	18.25	4.38	7.71	5.98	3.96
Index	-9.28	-10.32	-4.53	-3.22	-2.05	0.02	-4.34	-21.36	-2.47	-1.40	2.21	4.05
Large.Cap	-1.63	-8.10	-3.33	2.75	8.53	18.31	1.50	-22.39	7.27	21.61	25.94	19.39
Mid.Cap	-9.55	-0.38	-0.38	11.39	19.97	14.74	6.03	-17.52	4.85	17.71	17.90	12.45
					Proportional return-sign allocation of CR							
Positive.CR	0.50	0.25	0.25	0.50	0.78	1.00	0.56	0.22	0.78	1.00	1.00	1.00
Negative.CR	0.50	0.75	0.75	0.50	0.22	0.00	0.44	0.78	0.22	0.00	0.00	0.00
					CR average of gold mining shares							
All.Stocks	-3.61	-6.17	-2.59	4.91	11.07	17.52	2.51	-21.30	6.74	20.74	24.16	17.85
CAN												
					Sub-categorization by market capitalization							
Gold	7.71	5.97	6.80	7.23	14.69	18.42	9.86	18.25	4.38	7.71	5.98	3.96
Index	-6.13	-9.76	-7.72	-6.33	1.12	-5.17	-16.72	-34.26	0.23	1.61	3.44	3.71
Large.Cap	6.53	4.01	13.52	7.38	4.38	6.74	-9.21	-27.54	5.44	14.76	13.93	7.22
Mid.Cap	0.00	-8.70	-18.23	-21.62	-2.70	-2.13	-11.13	-15.66	17.38	40.83	34.91	30.04
					Proportional return-sign allocation of CR							
Positive.CR	0.80	0.64	0.82	0.75	0.57	0.70	0.24	0.14	0.92	0.92	0.88	0.76
Negative.CR	0.20	0.36	0.18	0.25	0.43	0.30	0.76	0.86	0.08	0.08	0.12	0.24
					CR average of gold mining shares							
All.Stocks	7.18	3.22	11.87	4.96	3.36	5.75	-9.49	-25.84	7.39	18.72	17.11	10.87
UK												
					Sub-categorization by market capitalization							
Gold	7.71	5.97	6.80	7.23	14.69	18.42	9.86	18.25	4.38	7.71	5.98	3.96
Index	-3.41	-9.83	-6.32	-1.72	-1.76	-6.56	-8.91	-31.45	0.13	1.12	4.84	5.85
Large.Cap	-0.52	-0.43	3.51	-6.20	10.66	10.00	-10.54	-27.19	14.83	30.46	31.23	26.40
					Proportional return-sign allocation of CR							
Positive.CR	0.00	0.00	1.00	0.00	0.75	0.75	0.50	0.25	0.83	1.00	1.00	0.83
Negative.cR	1.00	1.00	0.00	1.00	0.25	0.25	0.50	0.75	0.17	0.00	0.00	0.17
					CR average of gold mining shares							
All.Stocks	-0.52	-0.43	3.51	-6.20	10.66	10.00	-10.54	-27.19	14.83	30.46	31.23	26.40
US												
					Sub-categorization by market capitalization							
Gold	7.71	5.97	6.80	7.23	14.69	18.42	9.86	18.25	4.38	7.71	5.98	3.96
Index	-5.05	-8.51	-5.07	-2.79	0.27	-3.14	-12.99	-33.07	-0.71	0.68	3.16	4.11
Large.Cap	11.61	10.99	22.67	20.42	13.05	11.17	-12.48	-14.92	7.14	19.69	24.06	18.22
Mid.Cap	15.86	13.68	9.04	20.06	21.90	24.90	-1.61	-28.70	26.39	30.67	30.27	9.68
Small.Cap	-7.59	-0.94	-6.09	-9.97	-14.41	-12.97	-20.42	-53.51	-10.38	-20.22	-40.55	-27.37
					Proportional return-sign allocation of CR							
Positive.CR	0.86	0.86	0.71	0.86	0.71	0.86	0.29	0.14	0.86	0.86	0.86	0.86
Negative.CR	0.14	0.14	0.29	0.14	0.29	0.14	0.71	0.86	0.14	0.14	0.14	0.14
					CR average of gold mining shares							
All.Stocks	10.08	10.06	14.67	15.98	11.65	11.64	-10.51	-24.37	10.14	17.13	16.60	9.27
ALL												
					CR average of gold mining shares							
	5.31***	3.36***	9.43***	7.70***	7.18**	9.61	-7.13	-24.72	8.60***	20.48**	20.28***	13.95***

Note: Panel AUS, CAN, UK and US depict percentage cumulative returns over 5, 10, 15 and 20 trading days for three defined crisis events. Respective Panels are divided in i) cumulative returns of gold bullion, stock index and a sub-categorization of available liquid mining companies, ii) proportional division of positive and negative cumulative returns, and iii) the average cumulative returns of all liquid mining companies. ***, **, * denote statistical significance at the 1%, 5% and 10% level.

Table 11: Cumulative Abnormal Returns (Liquid)

Event	9/11				Lehman Brothers				Brexit			
Holding period	5	10	15	20	5	10	15	20	5	10	15	20
AUS												
					Sub-categorization by market capitalization							
Large.Cap	-5.60	-10.23	-8.95	-5.96	-0.98	9.75	-2.49	-37.24	2.79	13.67	19.49	14.70
Mid.Cap	-14.68	-4.05	-10.95	-2.13	16.34	10.07	3.23	-22.47	0.29	6.76	8.85	7.40
					Proportional return-sign allocation of CAR							
Positive.CAR	0.25	0.00	0.25	0.25	0.57	1.00	0.43	0.14	0.70	0.90	0.90	0.90
Negative.CAR	0.75	1.00	0.75	0.75	0.43	0.00	0.57	0.86	0.30	0.10	0.10	0.10
					CAR average of gold mining shares							
All.Stocks	-7.87	-8.69	-9.45	-5.00	3.97	9.84	-0.86	-33.02	2.04	11.60	16.30	12.51
CAN												
					Sub-categorization by market capitalization							
Large.Cap	1.17	-2.75	2.70	-0.78	-4.88	-4.28	-13.85	-36.01	0.11	4.91	6.38	1.83
Mid.Cap	1.20	-11.10	-20.92	-24.39	-11.15	-12.73	-16.85	-26.20	12.35	32.12	29.08	27.45
					Proportional return-sign allocation of CAR							
Positive.CAR	0.67	0.58	0.42	0.50	0.33	0.28	0.11	0.00	0.48	0.88	0.80	0.40
Negative.CAR	0.33	0.42	0.58	0.50	0.67	0.72	0.89	1.00	0.52	0.12	0.20	0.60
					CAR average of gold mining shares							
All.Stocks	1.17	-3.44	0.73	-2.75	-5.93	-5.69	-14.35	-34.38	2.07	9.27	10.01	5.93
UK												
					Sub-categorization by market capitalization							
Large.Cap	-3.84	-4.70	-6.05	-23.08	-8.76	-8.72	-22.90	-40.68	9.57	21.19	23.86	21.27
					Proportional return-sign allocation of CAR							
Positive.CAR	0.00	0.00	0.00	0.00	0.33	0.33	0.00	0.00	0.83	0.83	0.83	0.83
Negative.CAR	1.00	1.00	1.00	1.00	0.67	0.67	1.00	1.00	0.17	0.17	0.17	0.17
					CAR average of gold mining shares							
All.Stocks	-3.84	-4.70	-6.05	-23.08	-8.76	-8.72	-22.90	-40.68	9.57	21.19	23.86	21.27
US												
					Sub-categorization by market capitalization							
Large.Cap	-4.64	10.76	12.71	14.87	3.16	-0.98	-18.34	-26.28	0.32	7.66	14.54	11.64
Mid.Cap	-7.36	-3.04	4.21	8.40	9.67	10.46	-7.05	-40.61	19.15	17.89	20.07	2.51
Small.Cap	-1.00	-4.41	-3.84	-12.02	-14.47	-12.52	-18.87	-51.69	-9.77	-18.84	-37.64	-22.90
					Proportional return-sign allocation of CAR							
Positive.CAR	0.00	0.57	0.71	0.71	0.57	0.57	0.14	0.14	0.57	0.86	0.86	0.86
Negative.CAR	1.00	0.43	0.29	0.29	0.43	0.43	0.86	0.86	0.43	0.14	0.14	0.14
					CAR average of gold mining shares							
All.Stocks	-4.89	4.65	7.92	9.18	2.50	0.64	-15.19	-34.01	4.26	6.80	8.66	4.10
ALL												
					CR average of gold mining shares							
	-2.31	-2.01	0.85	-0.49	-2.51	-1.58	-12.55***	-34.57***	3.32***	10.88***	12.85***	8.95***

Note: Panel AUS, CAN, UK and US depict percentage cumulative abnormal returns over 5, 10, 15 and 20 trading days for three defined crisis events. Respective Panels are divided in i) cumulative abnormal returns of available liquid mining companies sub-categorized by market capitalization, ii) a proportional division of positive and negative cumulative abnormal returns, and iii) the average cumulative abnormal returns of all liquid mining companies. ***, **, * denote statistical significance at the 1%, 5% and 10% level.

Table 12: Cumulative Abnormal Returns (Liquid, Long-Term)

Event	9/11				Lehman Brothers				Brexit			
Holding period	50	100	150	200	50	100	150	200	50	100	150	200
AUS												
					Sub-categorization by market capitalization							
Large.Cap	14.15	44.93	59.70	79.25	-69.70	-38.40	-20.96	-4.06	3.83	19.18	15.55	-3.60
Mid.Cap	32.76	50.79	70.58	101.33	-70.95	-5.09	28.93	52.87	-5.23	-21.55	-33.68	-46.57
					Proportional return-sign allocation of CAR							
Positive.CAR	0.75	1.00	1.00	1.00	0.14	0.29	0.57	0.57	0.60	0.70	0.40	0.40
Negative.CAR	0.25	0.00	0.00	0.00	0.86	0.71	0.43	0.43	0.40	0.30	0.60	0.60
					CAR average of gold mining shares							
All.Stocks	18.80	46.39	62.42	84.77	-70.06	-28.88	-6.70	12.20	1.11	6.96	0.78	-16.49
CAN												
					Sub-categorization by market capitalization							
Large.Cap	-4.20	16.94	36.94	57.64	-40.32	3.50	3.80	19.31	-7.43	-8.81	-5.66	-12.63
Mid.Cap	-27.82	-5.56	35.95	77.40	-32.42	-23.24	-15.22	-23.79	12.56	21.01	22.28	8.68
					Proportional return-sign allocation of CAR							
Positive.CAR	0.33	0.75	0.92	0.92	0.17	0.61	0.61	0.61	0.36	0.32	0.36	0.36
Negative.CAR	0.67	0.25	0.08	0.08	0.83	0.39	0.39	0.39	0.64	0.68	0.64	0.64
					CAR average of gold mining shares							
All.Stocks	-6.17	15.07	36.86	59.29	-39.00	-0.96	0.63	12.13	-4.23	-4.04	-1.19	-9.22
UK												
					Sub-categorization by market capitalization							
Large.Cap	-2.42	-5.89	2.51	3.79	-45.63	-10.94	-13.37	2.00	14.20	28.95	25.36	23.51
					Proportional return-sign allocation of CAR							
Positive.CAR	0.00	0.00	1.00	1.00	0.33	0.33	0.33	0.33	0.83	1.00	1.00	0.67
Negative.CAR	1.00	1.00	0.00	0.00	0.67	0.67	0.67	0.67	0.17	0.00	0.00	0.33
					CAR average of gold mining shares							
All.Stocks	-2.42	-5.89	2.51	3.79	-45.63	-10.94	-13.37	2.00	14.20	28.95	25.36	23.51
US												
					Sub-categorization by market capitalization							
Large.Cap	1.38	17.27	64.13	95.14	-61.88	-30.93	-24.64	-16.30	9.73	14.64	13.97	-6.16
Mid.Cap	-6.82	-13.39	5.95	46.51	-39.04	42.33	55.20	58.68	-25.53	-17.32	-10.53	-23.41
Small.Cap	2.66	23.58	4.77	-54.56	-54.84	-40.85	-35.34	-4.02	-29.84	-50.54	7.99	-2.60
					Proportional return-sign allocation of CAR							
Positive.CAR	0.57	0.57	0.86	0.71	0.14	0.43	0.57	0.43	0.43	0.43	0.71	0.14
Negative.CAR	0.43	0.43	0.14	0.29	0.86	0.57	0.43	0.57	0.57	0.57	0.29	0.86
					CAR average of gold mining shares							
All.Stocks	-0.78	9.41	39.03	59.86	-54.35	-11.42	-3.36	6.88	-6.00	-3.80	6.12	-10.58
ALL												
					CR average of gold mining shares							
	-0.28	17.76**	40.32***	61.39***	-48.85***	-9.49	-2.83	10.22	-1.07	2.41	3.60	-6.84

Note: Panel AUS, CAN, UK and US depict percentage cumulative abnormal returns over 50, 100, 150 and 200 trading days for three defined crisis events. Respective Panels are divided in i) cumulative abnormal returns of available liquid mining companies sub-categorized by market capitalization, ii) a proportional division of positive and negative cumulative abnormal returns, and iii) the average cumulative abnormal returns of all liquid mining companies. ***, **, * denote statistical significance at the 1%, 5% and 10% level.