Global Gold Mine Supply

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Thomas Brady, Ph.D., Chief Economist at the Newmont Mining Corporation, discusses an academic paper on the copper industry at the J.P. Morgan Center for Commodities' international commodities symposium, which was held at the University of Colorado Denver Business School from August 10, 2017 through August 11, 2017.

As the Chief Economist at Newmont Mining Corporation, my responsibilities include providing forecasts of key commodity prices, foreign exchange and other financial rates. These forecasts are then used in various activities throughout the corporation including mine and business planning, reserve and resource estimates, investment analyses, and in the public reporting of financial statements by our accounting teams. These forecasts are based on a mix of third-party analyst and economist projections, fundamental and econometric analysis of historical data, as well as an assessment of longer-term

fundamental, macroeconomic and demographic trends, including gold mine supply. This article will focus on the latter topic, the trends in gold mine supply. The article will review historical gold mine supply trends, along with their key drivers, and will conclude with my expectations regarding supply over the coming years.

Figure 1 displays global gold mine supply since 1900 (orange line) and the various drivers that buoyed growth trends including exploration success, technological advances and gold prices. Inflation-adjusted (or real) gold prices are also included (blue line).[1] As shown, global gold mine supply totaled approximately 12-million ounces in 1900. Aside from declines during the First and Second World Wars, global supply generally trended upward to nearly 50-million ounces by 1970.[2] A primary driver during this period was the very large and very deep reef deposit discoveries in the Witwatersrand in South Africa, particularly during the 1930s through the 1950s.

Figure 1
Gold Mine Supply (Left-Hand Side in Millions of Ounces) and Real Gold Price (Right-Hand Side in $/ounce) (Since 1900)
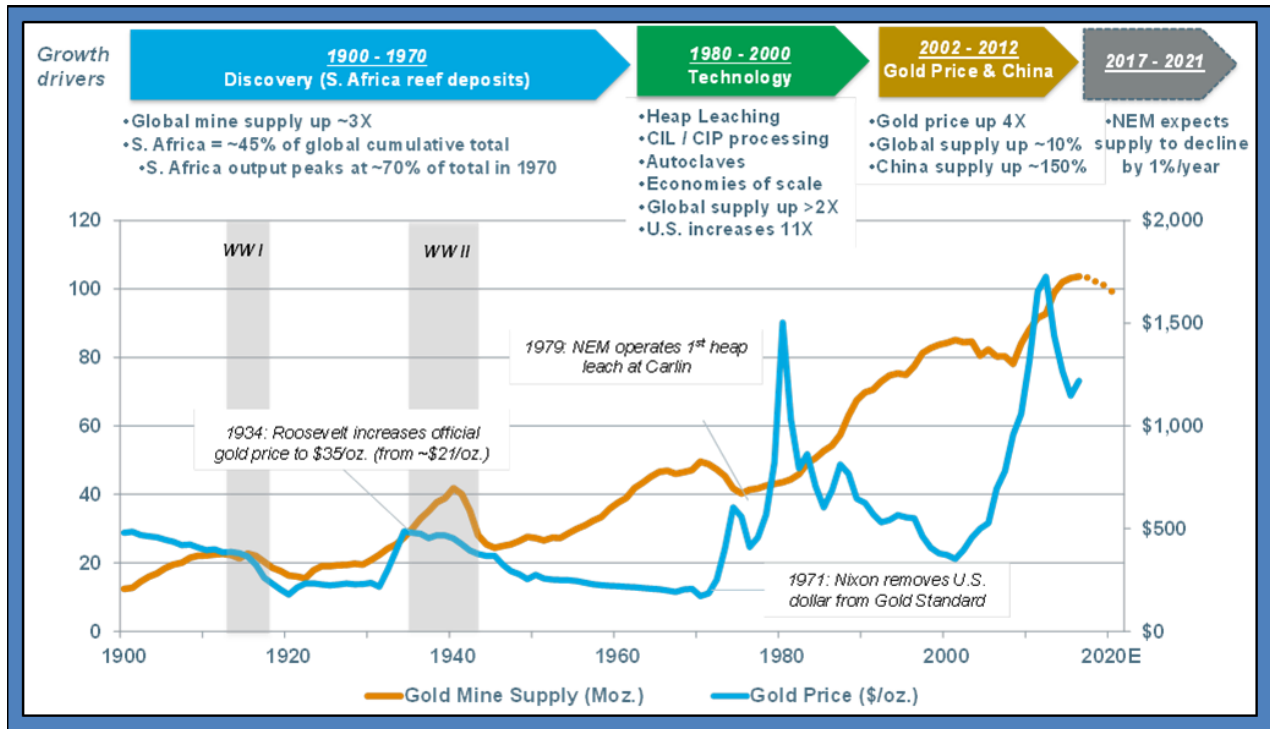
The abbreviations in this figure are as follows. "Moz": millions of ounces; "oz": ounces; NEM: Newmont Mining Corporation; and CIL / CIP processing: Carbon-in-Leach and Carbon-in-Pulp processing.

Cumulatively over this 70-year period, South African mines generated approximately 45 percent of total gold mine supply, climbing to contribute 70 percent of the annual global total in 1970. Through most of the 1970s, gold mine supply declined, driven by a nearly 20 percent drop in South African supply as mining companies encountered lower grades at traditional operations.

The growth in mine supply recommenced during the 1980s as the technological advancements in new processing techniques such as heap leaching, carbon-in-leach, carbon-in-pulp and others became increasingly widespread, allowing mining companies to profitably extract gold from lower-grade and more complex ore types. Specifically in 1979, Newmont began its first heap leaching operation at its Carlin, Nevada operations, which eventually contributed to annual supply from the state of Nevada increasing 10-fold over the following decade. Accompanying the implementation of new technologies during the 1980s and 1990s, supply growth was also driven by large scale gains in economies of scale with mining and other equipment.   For example, Caterpillar haul truck capacities climbed from approximately 150 tons with the CAT 785 in 1984 to over 360 tons in 1998.[3] From 1980, global mine supply more than doubled to 85-million ounces in 2001.

Figure 2 provides an example of how technological advancements and larger equipment have impacted operations at Newmont's Carlin area mines in Nevada, which have been in production since the mid-1960s. In 1965, Carlin produced approximately 130-thousand gold ounces with reserve grades of well over 0.3 ounces per ton. As shown in the figure, grades declined at the operation through the early 1980s to well below 0.1 ounces per ton. With the completion of Newmont's first heap-leaching operation in 1979, mining of large low-grade deposits (such as at the Gold Quarry Pit near Carlin), combined with larger equipment allowed production to climb slightly over 130-thousand ounces to over 1.5-million ounces by the end of the 1980s. By the early 1990s, Gold Quarry became the first mine to produce over 1-million gold ounces in a single year.

Figure 2
Reserve Ore Grades (Left-Hand Side in ounces/ton) and Production (Right-Hand Side in '000 ounces) at Newmont's Carlin, Nevada Mines
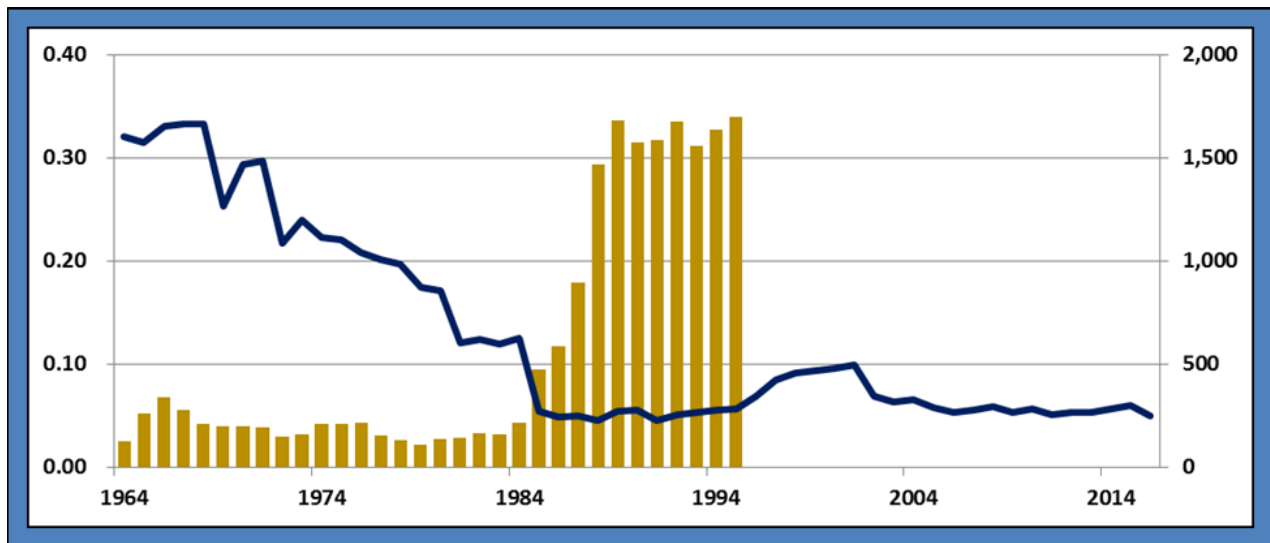
Source: Newmont's historical annual reports, production, reserve and resource reporting; and Newmont's reserve gold grade data for Carlin open pits and underground.

Following the acquisition of Santa Fe Gold in 1998, Newmont initiated reporting on operational results for all of Nevada; thus gold production is only shown through 1997 on this figure.

Reverting back to Figure 1, the most recent period of significant growth in mine supply commenced in 2009, resulting from a period of prolonged gold price increases that occurred during the Metals Super Cycle. As shown on Figure 1, gold prices climbed from a low in 2001, averaging slightly over $350 per ounce to well over $1,700 per ounce in 2012 (in real terms), a nearly four-fold increase. This period of sustained gold price gains allowed mining companies to aggressively expand exploration and project development budgets, contributing to global mine supply climbing to nearly 93-million ounces. Additionally, growth in Chinese mine supply was a key driver as output from the country increased from under 6-million ounces in 2002 to over 13-million ounces in 2012.

Exploration Spending is Fairly Responsive to Gold Price Trends

Within a typical mining company, exploration spending tends to be fairly responsive to gold price trends as these activities generally are one of the first areas within the firm that are ramped up (as prices begin to climb) or cut (as prices trend downward). Figure 3 displays exploration spending across the gold mining sector as well as for Newmont. Following an industry low of approximately $80-million in 2002, exploration spending across the sector increased at an annual rate of 25% per year to a peak of nearly $10-billion in 2012.[4] As shown on the figure, global gold exploration spending has since declined by over 65 percent to slightly over $3-billion in 2016.[5] Exploration spending at Newmont has followed very similar trends, from a low of under $40-million in 2001, to a peak of nearly $360-million in 2012, only to retreat to under $150-million last year.

Figure 3
Exploration Spending: Industry Total (Left-Hand Side in $Billions) and Newmont (Right-Hand Side in $Millions)
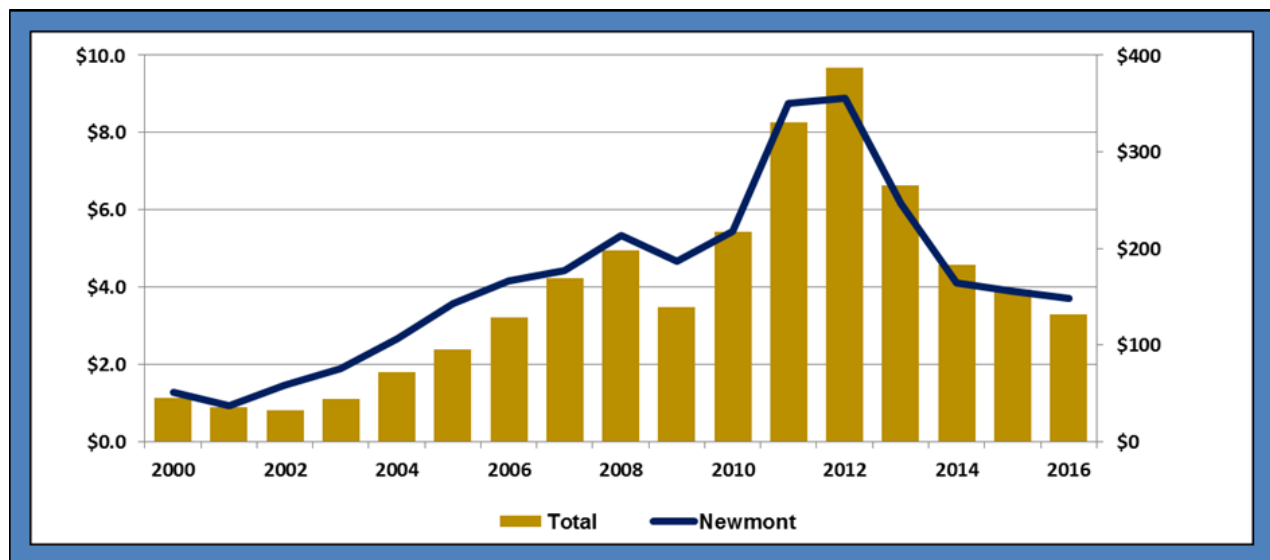
Source: SNL Financial and Newmont public financial statements.

The Inherent Lag with Price and Mine Supply Trends

While exploration spending may be more responsive to gold price trends, it takes multiple years for actual mine supply to react as miners typically continue to complete already-in-progress development projects (even if prices trend lower)[6] and/or begin to relax cost-cutting related programs (as prices initially begin to tick upward). As an example, in the mid-1990s real gold prices peaked in 1996, averaging approximately $550 per ounce at which point, a sustained period of aggressive price declines commenced.[7] By comparison, global mine supply only began to flatten and then trend lower beginning in 2001 (a lag of more than a half decade). A similar multi-year lag subsequently occurred with the aforementioned price uptrend in the early 2000s as mine supply only began to recover in 2009. Further, even as gold prices have retreated from the most recent highs in 2012, global mine supply has continued to climb, reaching nearly 104-million ounces in 2016.

A key contributor to the lag between inflection points in gold price and mine supply trends lies in the time required to advance a prospective property through exploration, feasibility studies, and project approvals to commercial production. Figure 4 provides an example for the Merian gold mine in Suriname, jointly owned by Newmont and the government.[8]

Figure 4
Merian Gold Mine Exploration Through Commercial Production
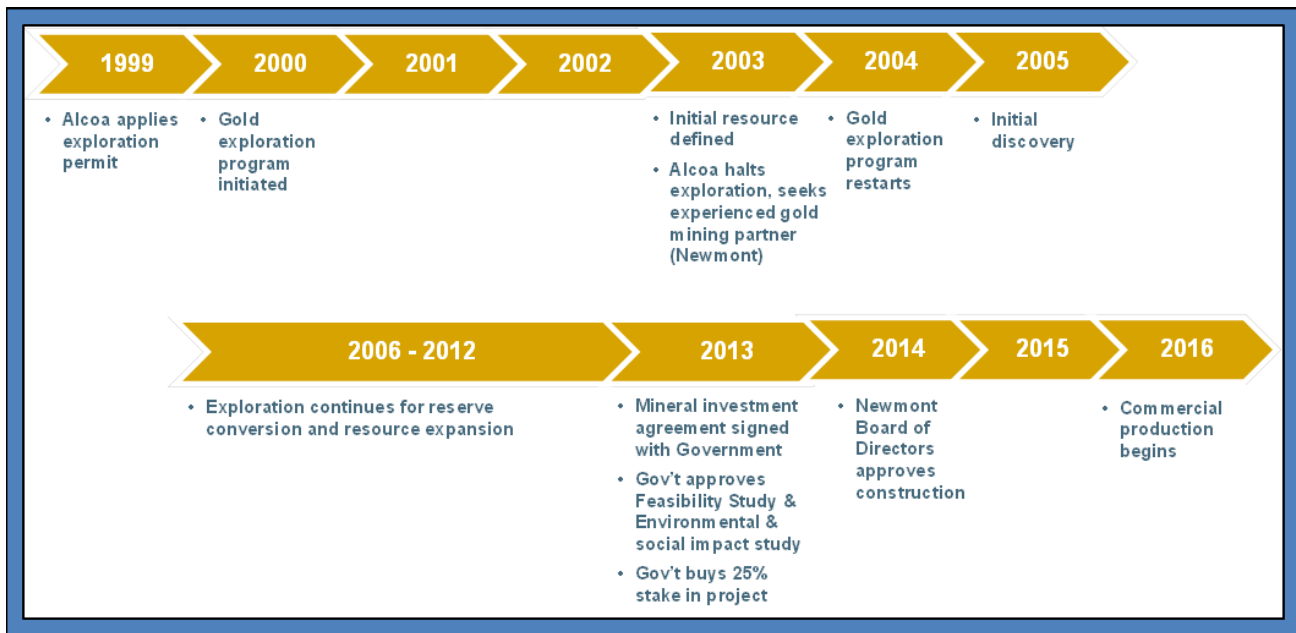
As shown, the previous owner of Merian (a subsidiary of Alcoa), first applied for an exploration permit in 1999, with drilling activities commencing in 2000. In 2003, an initial resource of approximately 180-thousand ounces was defined. Also during 2003, Alcoa halted this initial exploration program, seeking to partner with an experienced gold-focused company (Newmont). Following the finalization of a joint-venture agreement, exploration recommenced and an initial discovery was declared in 2005. Over the next seven years, exploration continued to expand both reserves and resources. Key investment and

other agreements were approved by the government in 2013, with the project receiving construction approval by Newmont's Board of Directors in 2014. Commercial production at Merian began in 2016 (17 years following the initial exploration program and more than a decade after the initial discovery was declared).

Expectations for Gradually Lower Mine Supply Going Forward

As shown on the dotted-line portion of the gold mine supply curve on Figure 1, my expectations are for global gold mine supply to gradually turn downward over the coming years. This supply downtrend will be driven by the recent trend of lower growth spending across the sector (on exploration and the advancement of development projects) and as the lag between price and supply trends is realized. I anticipate the scale of decline to be gradual, similar to declines in the mid-1990s through early 2000s where industry mine supply dropped by approximately 1 percent annually.

While Newmont has renewed its focus on exploration and business development efforts to expand reserves and resources, the company is not relying upon discovering major new resources, nor is Newmont banking upon game-changing technological advancements (similar to those realized during the 1980s and 1990s). Overall, Newmont remains centered on controlling the aspects of the business that it can: managing costs, continuing productivity improvements and planning for contingencies.

Endnotes

1 Real gold prices are in 2016 U.S. dollar terms.

2 For example, during WWII in the U.S., 8,000 individual gold operations were closed in support of the war effort.

3 Currently, the largest CAT truck is the 797F with approximately 400 tons of hauling capacity.

4 This corresponds to a period when gold prices averaged less than $400 per ounce to well over $1,700 per ounce (in real $2016 U.S. dollar terms).

5 This aggressive change in exploration spending is not unprecedented as similar spending declines occurred in the late 1980s as well as from 1997 through 2002, when cumulative spending dropped by 75%.

6 In addition, aggressive cost-cutting and productivity-improvement programs implemented across mining companies may allow marginal mines to remain active during initial phases of a downtrend.

7 A key driver of this price drop was the lack of an investment thesis for gold as many central banks (primarily in Europe) sold and/or liquidated their gold reserves.

8 Newmont has a 75% interest in Merian, with the remaining 25% owned by Staatsolie, an oil company which is owned by the Suriname government.

Author Biography

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Dr. Thomas Brady is currently the Chief Economist at Newmont Mining Corporation and is responsible for generating key commodity price, foreign exchange, and other financial assumptions used throughout the company, as noted in the article's introduction. In this role, Dr. Brady also develops methods to effectively quantify and communicate the economic impact of Newmont's operations to host communities and countries. Previously at Newmont, Dr. Brady led the Strategic Planning function that developed and implemented portfolio modeling analytics and also held positions in Investor Relations, Treasury and Corporate Development.

Previously Dr. Brady was a Senior Manager at Risk Capital Management, a consultancy that advised energy and natural resource companies on financial risk, valuation and commodity hedging.

Dr. Brady has also worked with CQG, Inc. where he developed a suite of automated trading systems for commodity futures contracts using the company's short-term, price and volume charting methods.

He holds a Ph.D. in Mineral Economics with research emphases in commodity markets from the Colorado School of Mines. In addition, Tom holds a Master's degree in Mathematics, also from the Colorado School of Mines.

Dr. Brady is a member of the J.P. Morgan Center for Commodities' Research Council as well as its Advisory Council. In addition, he serves as a member of the *Global Commodities Applied Research Digest*'s Editorial Advisory Board.