

Misunderstanding Gold Demand

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Introduction

Most gold market research is based on the premise that the supply side of the market can be characterized by the quantity supplied and demand side by the quantity demanded. The specific cause and effect relationship between these two variables and price is often unstated; and perhaps rightfully so: is it not obvious that a greater quantity demanded is the cause of a higher price, and that a greater quantity supplied is responsible for a lower price?

No.

This article will show that market forecasts based on quantities of gold are meaningless. Widespread statements like "Gold demand was up by 15% in 2012" are true but only if they are understood in a misleading sense. The supply and demand sides of the market consist of supply and demand *schedules*, not quantities. A price forecast based on quantities is a [non sequitur](#) because there is no causal connection from the quantities to the price. This error has side-tracked the majority of analysts into an obsessive focus on quantities while ignoring the actual drivers of the price.

The first part of this article will examine the definitions of *supply* and *demand* and discuss their relationship to price. Most analysts define supply and demand as quantities. There are several ways to do this. If used consistently, any of these definitions are valid but none of them are useful for the purpose of the purpose of price estimation.

After establishing the definitions, I will show that the quantities supplied and demanded must conform to an arithmetic relationship that is logically true but has no causal connection with the gold price. Supply and demand totals can be any numbers that satisfy the arithmetic relationship, while at the same time the price can rise, fall, or stay flat.

The next section will explain the true drivers of the gold price: the supply and demand *schedules*. These schedules are not scalar quantities and cannot be measured; they can only be observed indirectly through the gold price itself. I will show that the cause and effect relationship between quantity and price runs in the opposite direction from what is widely assumed. The quantities are driven by a temporary disequilibrium between the market price and the supply and demand schedules of investors. This disequilibrium induces market participants to supply, and to demand gold to bring their portfolio in line with their preferences.

The final section delves into materials from the CPM Group, a prominent and respected gold market research consultancy, showing how their research relies on the same error.

This article does not entirely stand alone; it builds upon other articles that I have written about the gold market, and on the marginal price theory of the Austrian

School. Some parts of this article will not make sense unless you are familiar with some of these concepts. I chose to do this partly to avoid repeating ideas that I have already published, and partly to control the length. I have linked to backup material that I believe is relevant.

The Usual Explanation

First, let's look at the examples. Most published analysis of the gold market is concerned with supply and demand numbers.

From the [UK Telegraph](#), under the headline, [Gold demand increases 15pc](#):

As the gold price increases, demand for gold and other precious metals has continued to grow. Demand for gold has continued to grow in 2012 and is predicted to increase further next year. Research by Source, a provider of exchange traded products, shows that inflows into European gold ETPs have reached \$6.8bn this year to date, constituting a staggering 15.4pc growth

Almost every page of the [World Gold Council's Third Quarter 2012 Gold Demand Trends](#) deals with either the quantity supplied or demanded by a sector of the market. The following sentences are selected at random for illustrative purposes:

Third quarter gold demand was up 10% on the previous quarter but 11% lower than record year-earlier levels (p1)

Investment demand was 16% below the exceptional levels witnessed in Q3 2011. (p2)

Total demand (including OTC investment and stock flows) was 2% weaker year-on-year ... (p2)

The most significant contribution to the fall in gold demand came from a drop in bar and coin investment.

The World Gold Council's web site contains the following:

Since 2003, investment has represented the strongest source of growth in demand. The last five years to the end of 2011 saw an increase in value terms of around 534%. In 2011 alone, investment attracted net inflows of approximately US\$82.9bn.

My third example cites CPM Group's [2012 Gold Yearbook Press Release](#):

Investment demand, the key driver for gold prices, remained at historically high levels last year. Net additions to private investor gold holdings declined to 34.3 million ounces in 2011, down 5.8% from 2010 levels. Even though net additions to private investor holdings slipped lower in 2011, a year in which prices touched a record high, the decline had followed two years of double-digit growth from already high levels of net additions to investor holdings. (p2)

Gold fabrication demand rose 0.6% to 72.9 million ounces in 2011, slower than the 2.3% growth in 2010 due to higher gold prices. Despite higher prices, many consumers sought to purchase more gold jewelry, specifically in developing countries, as a hedge against inflation and

form of savings. Developing countries' demand for gold in the form of jewelry rose to 50.2 million ounces, up from 49.6 million ounces. (p3)

The bearish [financial planner Arthur Stein](#) also [believes that gold demand is declining](#) (based on the [World Gold Council's](#) figures) which will result in a lower price:

Demand for Gold Declines, Will Prices Follow?

...Demand for gold has been declining worldwide, but prices haven't. What does this mean for someone investing in gold?

Gold demand declined 11 percent in the third quarter of 2012 compared to the third quarter of 2011, according to the World Gold Council (www.gold.org). Demand fell in every sector except for purchases by central banks.

Market Sectors and Flows

Most gold analysts divide the market into sectors. This section will discuss how this is done and what the quantities mean in relation to the sectors. A typical sector breakdown is: mines, industry, jewelry, investors, and the official sector (central banks). Some writers break the investment sector down into bars, coins, and ETFs. The choice of sectors is not critical to the points that follow; none of the conclusions would change if, instead of these sectors, flows between countries were used instead. Some reports combine the two approaches, dividing the developed world market into sectors and treating the rest of the world on a country or regional basis. Any of these breakdowns would serve equally well.

Below is a list of the sectors, their buying, and their selling:

Sector	Buying	Selling
Mine	Not a buyer	All production sold to the market, where it is eventually refined into investment, jewelry, or industrial products.
Industry	For electronics, dentistry, and other applications that use up gold.	Recovery from scrap
Jewelry	Raw material for fabrication.	Melt from scrap jewelry sold by people who no longer want it.
Investor	Additions to portfolio holdings.	Reductions from portfolio holdings.
Central banks	Add to gold reserves	Subtract from gold reserves

Inter-sector Flows and Quantity Balance

The quantity balance between sectors is at the core of most market analysis. The quantity balance is an equation relating all of the flows in the market to each

other. (A *flow* is the quantity bought and sold, while a *stock* is a quantity held by someone over time). Quantity balance is the requirement that every movement of gold must be accounted for on the buy side and the sell side. It is similar to the way that double-entry bookkeeping works. This section will derive the quantity balance equation. The following section will discuss its significance.

Over a one-year period, every trade that takes place between a buyer and a seller is counted in the following way: the quantity of gold bought (and sold) is added to the buying sector's gross quantity bought and to the selling sector's gross quantity sold.

At the end of the year, net flows for each sector are calculated. The definition of the net flow for a single sector is:

$$\text{sector net flow} = \text{sector total buying} - \text{sector total selling}$$

Sector net flow can be a positive number, meaning that the members of the sector bought more than it sold; or a negative number, indicating that the members of that sector sold, in aggregate, a greater quantity of gold than they bought.

Assuming that mines sell all of their production, which is nearly always true, mine sector net flow is always a negative number.

$$\text{mine net flow} = \text{mine buying} - \text{mine selling} = 0 - \text{mine selling} = - \text{quantity mined}$$

For every trade, the quantity bought is equal to the quantity sold. This means that the sum of all sector net flows is zero. By the rules of algebra, this arithmetic identity can be rearranged in several ways:

$$(1) \text{ quantity mined} + \text{net industry} + \text{net jewelry} + \text{net investor} + \text{net official} = 0$$

$$(2) \text{ net industry} + \text{net jewelry} + \text{net investor} + \text{net official} = \text{quantity mined}$$

The CPM Group uses a different sector breakdown than I have used here, so their quantity balance is a little bit different. They use the following market sectors: total supply (mine plus scrap), fabrication demand (industry plus jewelry), official sector and investment. Their quantity balance in their partitioning is summarized in equation (3), below.

$$(3) \text{ quantity mined} + \text{industry sold} + \text{jewelry sold} \\ = \text{industry bought} + \text{jewelry bought} + \text{net official} + \text{net investor}$$

In this breakdown, official and investor sectors have a net flow on the right side of the equation but the jewelry and industry sectors have gross purchases on the left of the equation and gross sales on the right.

The preceding equations are all saying the same thing: all the gold that comes out of mines ends up as net inflow into one or more market sectors. These identities all follow directly from the laws of arithmetic. They contain no new information. They are only a restatement of the original assumptions, namely, that miners sell all of their production, and that no gold is destroyed during a trade. The mine

sector net flow is always negative but the other sector net flows could be positive, negative or zero.

Gold can be destroyed not in the physical sense, but in the economic sense. This means that the industrial process renders some of the metal into a form where it would be too costly to recover. The boundary where recovering gold from industrial use is cost effective depends on many factors, especially the price of gold, which can change over time. Gold destruction occurs only in the industry market sector. The rate of gold production always exceeds gold destruction. Consequently the total of gold held above ground grows over time.

The False Logic of Quantities

I believe that the error of attributing gold price moves to quantities is based on the following invalid thought process on the demand side (with similar thoughts on the supply side not shown here):

1. The gold price is driven by supply and demand
2. Supply and demand are quantities
3. Looking at the demand side, more demand implies a higher price, less demand a lower price.
4. More supply means a lower price, less supply a higher price.
5. The key to forecasting the gold price is therefore measurement of gold supply and demand.

Arthur Stein is representative of this type of reasoning. Quoting at length from his [bearish forecast](#),

Gold is unlike other commodities in many respects. For investors, one of the significant differences is that the supply of gold (called "above-ground gold") never decreases; it only increases. So declining demand should cause a decline in the price of gold, not an increase.

The sources of total demand are another concern. Jewelry demand has been declining since at least 1997. Jewelry demand in 2011 was 40 percent lower than 1997 and demand in the first three quarters of 2012 was 9 percent lower than the same period in 2011. ... Industrial and dental demand declined in 2011 and is on track to decline another 6 percent this year. ... Investment demand (bars, coins, Exchange Traded Funds, etc.) declined 3% in the first three quarters of 2012 compared to 2011.

The bright spot for gold demand was official sector (central bank) purchases. Central bank activity went from net sales to net purchase in 2010, and net purchases continued to be positive in 2011 and the first three quarters of 2012.

The main problem with this view, as I will show in the next section, is that there is no cause and effect relationship between the quantities and price.

Flows not the Cause of Price

The financial media commonly reports that buying is the cause of the price going up. Stories in the financial media usually report only one side or the other side of the market. For example, an increasing number of small investors buying coins is often cited as the cause of gold price strength. However, the same story could equally well have been written as a bearish report about the increasing number of investors willing to sell their coins. Either story would be true, at least from a quantitative standpoint and both would be wrong in attributing the movement in the gold price to one side of the market only.

If the reporter accurately described a large volume of coin buying and an equal volume of coin selling, then what conclusion about the price should the reporter draw? Exactly none. Buying as such is not the cause of the higher gold price, nor is selling the cause of price declines. If buying could take place without selling or selling without buying, then one or the other could be an independent cause of price moves. But neither can occur without the other. Buying and selling occur always in equal quantities, and, at the same time. For every purchase of gold by a buyer, an equal quantity is sold by the seller. The quantity of buying, which is always the same as the quantity of selling, is not the cause of the gold price.

While everyone agrees that *the gold price is driven by supply and demand*, not everyone who voices agreement means the same thing. The correct version is: *the gold price is driven by supply schedules and demand schedules*. Most analysis of the gold market is based on an *incorrect* interpretation of the statement, namely, *the gold price is driven by the quantity supplied and the quantity demanded*. An increase in gold demand is the cause of a higher price if *an increase in demand*, means a change in the preference rankings of coin buyers for more gold/less cash. In that case, all other things equal, transactions would occur at a higher price.

The quantity balance equations are logically valid at all times, but they are accounting identities, not statements of cause and effect.¹ The quantity bought and sold is not an explanation of why the price moved. All inter-sector flows must balance, but flow is not the cause of the price; it is a summary quantity of gold traded, at whatever price. Any combination of positive, negative, or net inflows or outflows into any one or more sectors could occur during a year where the gold price was higher, lower, or unchanged.

Suppose during the last year that net investor inflow is a positive number and net official inflow is negative. This indicates that over one year, investors purchased gold from central banks. But this fact is an arithmetic identity, not a cause of the gold price movements during this year. If, the following year, central banks on net purchased gold from investors, we are still no closer to knowing at what price the gold was purchased, and whether that price is higher or lower than the current price.

¹ For another illustration of the confusion of accounting identities with causal relationships see Robert Murphy, [Krugman Falls Into the Keynesian Accounting Trap](#).

The True Cause of the Gold Price: Marginal Preferences

The theory of equilibrium price formation is necessary to understand the remainder of this article. I will not attempt a detailed explanation of the theory here, but the interested reader may find it in one of the following references: Rothbard shows in detail how supply and demand schedules are derived from individual preference rankings in [Man Economy and State](#), starting with his discussion in [Chapter 2 sections 4-5](#), and [Chapter 2, section 8: Stock and the Total Demand to Hold](#), and then later as applied to money in [Chapter 11 \(Money and its Purchasing Power\) sections 2-5](#).

Each investor strives to maintain their desired holdings of all potential assets, including cash (i.e. one or more national currencies such as the US dollar or euro). As their preferences change, and as market prices change, investors adjust their portfolio holdings, at the margin, to bring them in line with their preferences. The price of an asset emerges as investors balance, bid for assets they wish to hold more of and offer assets they prefer to hold less of.

Supply and demand as they contribute to the price must be understood not as quantities but as [schedules](#). Market prices balance the aggregated supply and demand schedules of the entire market. These aggregated schedules are also known as the more widely used [supply and demand curves](#). In the standard micro-economic presentation, the supply and demand curves intersect at a point, marking the price and the quantity.

I have written about the application of supply and demand schedules to the gold market in [Does Gold Mining Matter?](#) There I explain that the supply schedule for gold (in dollar terms) is dominated by the owners of the world's existing stockpile of gold, and that mined gold during any one year period has a relatively small impact on the supply schedule. The price is set primarily by the reservation demand schedules of the owners of the existing gold. In the same piece, I show that the quantity mined, which many analysts incorrectly believe is "the supply", has little influence on the gold price.

The quantity balance constraint cannot be a cause of the gold price because balance equations contain only quantities. The gold price is the quantity of money exchanged for the quantity of gold. Any explanation of the gold price must contain some reference to the quantity of money involved. Equilibrium price theory provides a complete theory of the cause of the gold price, taking into account the gold and money sides of the market.

If the gold price is higher now than it was at some point in the past, that can only be due to a shift in preference schedules. One of the following must be true: 1) either buyers valued the gold more highly and thus were willing to pay higher price, or 2) sellers valued their gold more highly and were only willing to part with it at a higher price. Historical net flows provide a summary of where in the market were the buyers who valued gold the most highly, and the sellers who valued it the least.

Up to this point I have argued that the quantities supplied and demanded are not the cause of the gold price. The true causal relationship between price and quantity is nearly in the opposite direction. Transactions occur in the market because there are some investors whose mix of cash and gold holdings is not

consistent with their preferences. Trading will occur until everyone has adjusted their portfolios, at the margin, to their preferred holdings. If no one changed their preferences after this moment, and no new gold were mined, then no more trading would occur.

Trading continues because people are always changing their minds about what they want to own. Individuals who did not previously consider themselves gold investors enter the market; others no longer consider gold a good investment and sell out. The more individual investors that have changed their preference rankings since the last market price, the greater the disequilibrium in the market, and the more change in the ownership of gold and cash is necessary in order for investors to reach their desired holdings. The volume of trading reflects the extent that holdings of some individuals no longer reflect their preferences.

Attributing a higher gold price to an increase in coin buying alone ignores the equal quantity of coin selling that is necessary for more coin buying to occur. More coin buying means more coin selling. The media story about coin buyers driving the gold price higher could be correct, if the buyers are the only ones whose preferences have changed. In that case they are willing to pay up, driving the market clearing price higher into the offer side of the market. But action in the coin shops could also result from sellers liquidating at lower prices, or a simultaneous set of changes by some buyers and some sellers that cancelled each other out in price action, leaving the price unchanged after a large volume of trading.

Demand Schedules Not Measurable

So far I have argued that the gold price is an outcome of the preference schedules of investors. A preference schedule is not a number. It is a spiky curve representing a range of quantities and prices. Schedules are not directly measurable in the way that quantities are, because they include hypothetical quantities that would be supplied and demanded at prices above and below the market. In order to have the complete supply and demand schedules, the analyst would have to know how much gold would be sold and purchased at every price. When gold trades, we know only that the quantity supplied and demanded at one price.

Laura Davidson explains this point in her excellent piece [The Causes of Price Inflation and Deflation](#). In reading the quoted passage, it may help to understand that *reservation demand for money* is another term that means the same thing as the term that I have been using, cash holding preference, except measured against all goods in general.

When the social reservation demand for money changes, it can neither be measured nor observed directly. Whether market participants hoard money, or dishoard it, the amount of money in their wallets and their bank balances in the aggregate remains exactly the same ceteris paribus. There is no special place from which money flows, or to which it flows, when the demand for cash balances changes.

The same point can be made for any good that is demanded in order to be held in stockpiles. Examples include not only gold but most financial assets such as stocks and bonds. Reservation demand can be inferred, indirectly, by observing the price. Davidson continues,

Nevertheless, it is possible to observe the effects of the change [in reservation demand]. Suppose, for example, prices-in-general are falling, and yet the supply of goods in the market has not changed. From this it can be deduced that the exchange demand for goods must have fallen. But let us also suppose the money stock has not changed. This leaves only the reservation demand for money as the causative factor for the reduction in the demand for goods and the ultimate cause of the price deflation.

While I have spent most of this article discussing demand, the supply side of the market works the same way. Supply schedules and demand schedules together drive the gold price. Supply schedules are immeasurable as are demand schedules.

Conclusion

The main point that I have tried to show is that the demand numbers used in most gold market reports do not measure the demand side of the price formation process. The same could be said about the supply number. These two numbers are connected through the quantity balance constraint but they are not the cause of the gold price.

Gold market analysts have a tougher job other financial analysts. In [Value Investors Hate Gold](#), I argue that it is more difficult to analyze the yellow metal than equities because quantitative measures such as yield, cash flows, balance sheet leverage, and growth rates provide a fundamental basis for analysis. Gold has none of those things.

The fundamentals of gold are the current purchasing power of money; expectations about the future purchasing power of money; the growth rates of various national money supplies; the volume of bad debts in the system; expected growth rates of bad debts; the attractiveness of other available investments; and the investor's preference for consumption rather than investment. These factors do not act directly on the gold price. Instead, they are focused through the prism of investor preferences, which are not measurable. The price is the ultimate measurement of how investors view these factors. The paradox of gold is that which drives the price cannot be measured, that which can be measured does not drive the price.

Appendix: The CPM Group

Introduction

I have devoted an entire section to [The CPM Group](#)'s gold research because, of all of the major research firms, they have has the most information available about how they think. While I chose to focus on the CPM Group, as far as I have been able to determine from published reports, [GFMS](#) agrees on the basic framework of the quantity model, if not on all of the particulars. The other major research firm, the [WGC](#), uses the numbers compiled by GFMS. From those aspects of the CPM Group's thinking that are available to the public, I have tried to reverse engineer how they see the gold price from what is available.

In the next section I will explain my interpretation of their thinking. And then, in the following section I will provide my critique of the CPM Group. I have found several problems in their model: the first, that they consider market data on a year-by-year segregated basis; the second, the belief that gold holdings are not part of the market; and third, the premise that net flows drive the gold price. I will discuss each of these points in more detail below.

The CPM Group's Model

My sources consist of the [CPM Gold Yearbook 2012](#) (cited below as *Yearbook*) and a 1996 presentation to the Australian Gold Conference by the CPM Group's founder Jeffrey Christian, [Gold: Supply, Demand, Price and Research](#) (below, *AGC Presentation*).² After reading the sources, I have synthesized what I believe to be the CPM Group's model of supply, demand, and price into the following propositions:

Gold Supply: The gold supply consists of mine production plus "secondary sales". The latter consists of melted gold sold in the form of scrap by the jewelry sector and the fabrication sector. See the Yearbook, p. 105: *Gold supply, which includes gold output from mines in market economies, gold exports from transitional economies into market economies, and old gold scrap that has been refined, is estimated to have totaled 119.9 million ounces in 2011....*

Gold Demand: Gold demand is the sum of the following: industrial use (electronics, dental, medical, other), gold use to make new jewelry, official sector net flow (IMF, US, Canada, other) and investor sector net flow (coins, bullion, bars, Indian). See the Yearbook, pages 6-7. Investment demand is defined by CPM in some places as the net flow of the investor sector and in other places as the net flow of the investor and official sectors combined. My citations in support of this are:

- Yearbook, p. 4, labels on the chart titled *Gold Supply and Demand* shows investor demand as the difference between supply (defined as mine + secondary) and fabrication demand. From the quantity balance equation (3, above), total supply less fabrication demand must equal net investor and official sector flows.
- Yearbook, p 11: *Net purchases of gold by central banks have complemented healthy gold investment demand....* If net central bank purchases have complemented investor demand, they cannot be the same thing.
- See the Yearbook, p. 29, *Investment demand* (subtitle), followed by: *Net additions to private investor gold holdings declined to 34.3 million ounces in 2011*

² I had hoped to use only free sources but I found that the yearbook, which is priced at \$150, contained invaluable information in my understanding of the CPM Group's model. The CPM Group originally provided me with a free copy of the yearbook, but prior to writing this article, I purchased a copy at the normal retail price.

Quantity Balance: Demand equals supply. See the Yearbook, pages 6-7. The total supply consists of 31.0Moz mined, 4.5Moz secondary, and 13.2Moz from transitional economies for a total of 50.0Mz. Total demand consists of 43.9Moz fabrication, -8.7Moz official sector reserve sales, and 14.8 net investor portfolio additions, for a total of 50.0Moz.

Quantities Drive the Gold Price: Each of the terms in the quantity balance equation is a contributing cause of the gold price, with net investment demand being the most important cause. If the net investor sector flow is a large positive number, this is deemed a cause of a higher gold price, while a small positive or a negative number is deemed a cause of a lower gold price. My reason for thinking this is the following citations:

- *Yearbook*, p. 8: (chart) Net Investment Demand is plotted on the left scale of the chart with the gold price on the right scale. The chart's title is *Investment Demand's Effect [sic] on Gold Prices*.
- *Yearbook*, p. 9: *Gold investment demand is one of the strongest influences on gold prices.*
- *Yearbook*, p. 10: *...it is projected that net additions to private investor gold holdings will remain at extremely high levels, which is expected to help keep prices at elevated levels during 2012.*
- *Yearbook*, p. 69: "Central banks were net buyers of gold for the fourth consecutive year in 2011". (i.e. net flow into the central bank sector was a positive number).
- *Yearbook*, p. 233: *Strong investment demand for gold, particularly during the first three quarters of the year, pushed prices higher.*
- *AGC Presentation*, p. 4: *my next slide [not shown in PDF – rb] illustrates the weightings of each supply and demand sector in CPM Group's main gold price model. Central bank activity and investment demand trends ... exert much more powerful influences in determining the gold price.*
- *AGC Presentation* p. 8: *SLIDE SEVEN: Investment Demand's Effect on Prices. My next chart compares levels of investment demand for gold to changes in gold prices. We call it our most important chart. Herein lies the key to accurate gold price forecasts: Investment demand is the most important influence on gold prices. Markets are made at the margin, and in the gold market investors are the marginal market participants.*
- *AGC Presentation*, p. 8: *Over the past few years, investors have not been buying a great deal of gold. As a consequence, gold prices have languished. Investment demand reached a low of 184 mt (5.9 million ounces) in 1994. Investor demand increased 11.7% in 1995, but the level, at 205 mt (6.6 million ounces), remained low. A further increase, to around 239 mt (7.7 million ounces), is projected for this year. The steady increase is being reflected in the slow upward march in gold prices; the low levels overall are being reflected in the fact that prices are not rising sharply.*

Forecasting the Gold Price: Knowing the cause of an event does not necessarily help to forecast the event. A cause can only be used to

forecast an effect if the cause occurs far enough in time before the effect that the cause can be identified and acted on.

Mr. Christian states that net investor flows can be used to forecast the gold price. I am not clear from the following whether Christian is saying that the net investor flows in one year can be used to forecast the following year's gold price, or whether he means that a correct forecast of next year's net investor flows is the key to forecasting the next year's price. Below is a relevant passage:

AGC Presentation p. 8: SLIDE SEVEN: Investment Demand's Effect on Prices. My next chart compares levels of investment demand for gold to changes in gold prices. We call it our most important chart. Herein lies the key to accurate gold price forecasts: Investment demand is the most important influence on gold prices. Markets are made at the margin, and in the gold market investors are the marginal market participants.

Summary: Based on the above, it appears the CPM Group posits the following logic regarding the gold market, though I cannot say for certain because their quantitative model is proprietary.

1. Supply is defined as mine plus secondary
2. Demand is the sum of the various components.
3. The price on any market is set by supply and demand. If the number that CPM has defined as "demand" increases, the price will be higher.

Critique of CPM Group's Model

Consumption versus Asset

My first criticism of the CPM Group's model is that conceive the of the price formation process only in the context of annual data. In fact, annual production and consumption quantities are quite unimportant in the overall picture of gold price formation. The error of looking at gold as an annual market is widespread and follows from a failure to understand the difference between a consumption commodity and an asset.

Most commodities are produced primarily for consumption. Consumption permanently destroys the economic value of the commodity (or in some cases, makes the commodity costly to recover back to a form where it has economic value). The market demonstrates that a commodity is produced mainly for consumption by the lack of large above-ground stockpiles. A small stockpile measured in terms of production output would be several days, weeks or a small number of months at most. All commodities other than gold have stockpiles that are small by this definition.

In consumption commodity markets, production and consumption must remain very nearly in balance because on the one hand, reserves will be depleted quickly if consumption exceeds production and, on the other hand, production can only exceed consumption if stockpiles increase. Stockpiles generally will not increase much beyond a few weeks or months of production flow because users and speculators have historically demonstrated that they are not willing to hoard larger

supplies. For a consumption type commodity, the supply that is produced during a given year, plus small stockpiles, is the only supply available for consumption during that year.

An asset is a good that people buy in order to hold, rather than consume. Some examples of assets are land, property, money, stocks, bonds, and gold. Nearly all of the gold ever mined still exists either as bars, coins, or jewelry. The total quantity of gold stockpiles grows by about 1-2% per year, implying a ratio of stockpiles to one year production in the 50 to 100 x range. Only a small amount of gold is truly consumed. Even jewelry fabrication is not consumption because its bullion value is retained and can be reclaimed at the relatively low cost of melting. Gold is held in a continuum of products which can be transformed from one to the other, such as bars, coins, and jewelry.

Price formation in an asset market works differently than in a consumption market. Because consumption goods are bought in order to be permanently destroyed, buyers must bid for newly mined product. The reservation demand to and from stockpiles does not play much of a role in the pricing process. All possible supply (regardless of price) is from recent production, and any possible demand (regardless of price) is demand for current consumption. In a consumption good market, the lack of stockpiles ensures that:

quantity supplied = quantity produced

quantity demanded = quantity consumed

In an asset market production and consumption (destruction) do not significantly impact the supply or the demand because they both are small compared to the above-ground supply. In a consumption market, the trade is mostly from producers to consumers, while the majority of gold trading consists of movement of gold from one stockpile to another stockpile. The supply schedules are dominated by the offers of existing stockpiles at a range of prices. The demand schedules are dominated by reservation demand to hold existing stockpiles. Selling by producers and buying by (destructive) consumers is small in comparison.

As I have explained [here](#), the gold market is a single integrated market where all sellers compete against all buyers. It is not an annual market for the current year's supply. Buyers compete to buy any gold, not only for gold mined in the last year. All sellers compete to find buyers. The reservation demand for existing stocks, because it is so large, is the major player in the price formation process.

While I have argued above that the quantities traded do not drive the price, my point here is a different one. Consider a gold market without producers or (destructive) consumers. The market would clear at a price and quantity where the supply and demand schedules come into balance. Adding a relatively small quantity to either side of the market would not move the price much, even if the buyer (seller) were totally price-insensitive because of the large depth of the supply and demand schedule on either side of it.

Recent Activity Sets the Price

In the AGC Presentation (p. 100), Mr. Christian explains that he does not consider gold holdings to be part of the market if those holdings have not changed hands recently. This is consistent with the view discussed in the previous section, that

the market price clears only the current year's supply against the current year's demand. If I understand the reasoning behind this, Mr. Christian believes that only transactions participate in price formation. After a particular gold ounce has not been traded for a long enough time, he no longer considers that ounce to be part of the market. At that point, in Mr. Christian's view, that ounce has no impact on the market price. This view is consistent with the CPM's mistaken focus on quantities traded as the keys to the gold market:

Gold also has a multiplier. For the Australian dollar, as with the U.S. dollar, I believe the multiplier is around 3 or 4. For gold, our estimate is that the multiplier is around 9 at present. That is, an ounce of gold entering the bullion market, from mine output, scrap recovery, central bank sales, or wherever, will be involved in 9 transactions before it exits the bullion market, either being used in a fabricated product or being dumped into an investor's inventories somewhere.

Mr. Christian's view is entirely mistaken. As I have explained, the supply side of the market is formed by all of the owners of existing gold, who offer it at a range of reservation prices. The price is an emergent property of the decisions of all of the owners of gold stockpiles to not to sell below their reservation prices, and the decisions of gold bidders not to offer above their reservation prices. The reservation demand of the sellers of existing gold, no matter how long ago it last traded, is the *primary reason* for the gold price being where it is.

Net Sector Flows

My second criticism of the CPM Group's model is over-emphasis on net sector flows. In the preceding section, I discussed Mr. Christian's incorrect view that gold holdings are not part of the market. Removing holdings (the primary locus of price formation) from consideration leaves only quantities recently traded as a possible object of investigation. The CPM Group goes to the far regions of the earth to measure quantities. The effort expended to get the numbers is impressive. While these numbers contribute to our understanding of what is going on in the market, they are largely irrelevant to an understanding of the price.

As explained above, net sector flows are caused by preference changes, and are not a cause of the gold price. Quantity balance rules require that "total supply" as the CPM Group defines it be equal to the sum of gross fabrication demand and net investment flows (private and official). This identity is logically valid and true at all times, but it contains no information about the cause of the price, for the reasons given above: a net flow into, or out of, one sector of buyers is not the cause of the price being higher, or lower. For every inflow into one market sector, there are equal and opposite outflows from other market sectors.

As discussed above, I believe that the CPM Group's model attributes causality to net flows based on the mistaken belief that the market's price equilibration process only balances net flows during a year. As explained, flows are not a cause or driver of the price; they are a reflection of changes in preferences that have occurred since the last trading activity. These changes in preferences determine where the gold flows.

CPM Group: Conclusion

The CPM Group's approach to the gold market is consistent with common practices in the industry. Their approach is not any more mistaken than that of the other analysts who do things the same way. I have chosen CPM as the subject of this appendix because the clarity and detail of their reports has made it easier for me to follow their thinking. I do not take issue with the entire contents of the yearbook, only with their misuse of quantities.

I cannot rule out the possibility that the CPM Group has found statistical correlations between net flows into or out of one of the sectors, and the gold price and that these correlations are employed in their proprietary model. This could occur if it were generally true over many years that actors in one sector (or country) tended to be more price sensitive, or those in other sectors less price sensitive. If that were the case, then buying by the traditionally price-insensitive buyers would be correlated with a higher gold price and selling by price-sensitive buyers would be coincident with a lower gold price.

I should also give CPM Group credit for their study of macro-economic factors that do impact the gold price. These factors influence the price *through their effect on investor preferences*. I agree with the [2012 Gold Yearbook Press Release](#) that "a host of economic, financial and political problems" are driving investor interest in gold. The Yearbook covers in detail macro-economic factors such as monetary policy, the business cycle, currency exchange rates, debt, and political uncertainty.

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