

Price Spikes and Forward Markets for Gasoline

by

Jeffrey Williams and Jennifer Thompson

The forward market for wholesale gasoline in California proves to be sufficiently active and its prices sufficiently sensible to attract imports during local refinery outages. California prices spike principally because of the time needed to ship California-grade gasoline, about one month, which, not coincidentally, is the time frame in the forward market.

In response to the refinery outages in 1999 that caused the price of gasoline in California to spike relative to prices elsewhere in the country, the California Legislature (Assembly Bill 2076) directed the California Energy Commission (CEC) to investigate the feasibility of the State operating a “strategic fuel reserve.” The CEC reported back to the legislature in July 2003 with a recommendation against such a gasoline reserve. Before drawing this conclusion, the CEC sponsored a number of studies, not only of state storage of gasoline but also of alternatives for mitigating price variability, such as expanded marine infrastructure for imports or more liquid forward markets.

We participated in the study of the gasoline forward market in California, conducting interviews with market reporters and some twenty traders who ranged in size from small independent jobbers to integrated multinationals. Surprisingly little was known about wholesale markets for gasoline in California, even such basic facts as the number of trades per day and their typical size. Perhaps it would be more accurate to say that these facts had not been documented, for the traders themselves knew them. Among policy makers and energy economists, the prevailing belief was that the gasoline forward market in California was relatively illiquid and did not cover very far into the future, at least in comparison to forward markets centered on the U.S. Gulf Coast, New York Harbor (including the active futures market on NYMEX), northwest Europe, Singapore and Tokyo Harbor (including the new futures market on TOCOM).

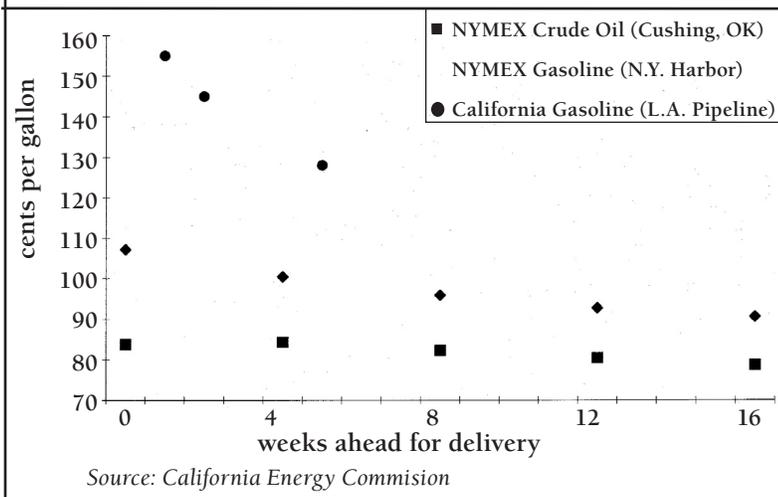
In the forward market, traders buy and sell forward contracts specifying the conditions (e.g. price, delivery date, grade) for future delivery of gasoline. Ideally, forward prices serve as the signal guiding the accumulation or release of inventories because storage, by its nature, allows adjustment between current and future conditions. Forward prices also serve as the signal for attracting imports of gasoline, because imports take time to arrive. Forward prices can serve as signals for a particular firm even if it does

not trade in the forward market, provided the trades of others are reported. For those who do trade, the forward market converts highly risky ventures, such as a cargo sent across the Pacific with the hope that the spot price in California will still be high when the tanker arrives, into nearly certain, arbitrage-like operations.

Despite their advantages, forward markets are delicate institutions, easily disrupted by disputes over the performance of contracts after months have passed and conditions have changed. For a prospective importer of gasoline, the difficulty of finding counterparties who reliably perform their side of contracts acts much like a tariff. Such an “illiquidity tariff” might be sufficiently high to preclude those imports. It was thought a likely contributing factor to California’s relatively illiquid forward market is a lack of buyers relative to the number of possible sellers of forward contracts. A variety of state agencies purchased gasoline in bulk under contracts tied to wholesale spot prices, thus it was thought that the state could enhance the volume in the forward market if these agencies were to purchase their fuel under contracts tied to forward prices. The additional volume prompted by the state might contribute the critical level of liquidity required to facilitate forward sales by gasoline importers.

Gasoline Forward Markets in California

Unlike most commodities, gasoline has two levels that could be called “wholesale.” Gasoline arrives at retail outlets by truck, each carrying some 8,000 gallons. But that gasoline has traveled most of the distance by pipeline, and in even larger quantities—the minimum shipment being over one million gallons. One pipeline system, originating in the refineries and storage facilities ringing San Francisco Bay, serves Northern California and Nevada, while another pipeline system, originating in the zone of refineries between the Ports of Los Angeles and Long Beach, serves Southern California, Arizona and Nevada. Gasoline moving within California through

Figure 1. Constellations of Prices on September 7, 2000

these pipelines is identical, although it varies from season to season and from gasoline elsewhere, according to the specifications set by the California Air Resources Board. In addition to the integrated “majors” involved in all phases from obtaining crude through retailing gasoline, “independents” specialize in refining, importing and distribution, which concerns the pipeline flows, or “jobbing,” which concerns the truckload deliveries to retail outlets. Altogether, some 30 or 40 enterprises could participate in a forward transaction, which is based on deliveries through pipelines.

With an ever-increasing gasoline demand of roughly one million barrels per day (42 million gallons at 42 gallons per barrel) in California, one might expect comparable volume in a forward market. According to all gasoline traders interviewed, the forward market for gasoline in California does not approach close to a volume of one million barrels per day, but neither is the volume trivial. Many traders estimated the volume to be on the order of 100,000 barrels per day, corresponding to four trades per day, the typical trade being a “piece” of twenty-five thousand barrels. (No central exchange records these deals. Private market-reporting services, namely Platts and OPIS, are the principal source for the traders’ sense of what others are doing.) The range around this mean estimate is surprisingly wide, and with it the perceived “depth” of the forward market. Some traders thought it unlikely that they could sell as many as 100,000 barrels without a detrimental effect on the price, while a few thought that the forward market could absorb 300,000. Most traders

agreed that a transaction for twenty-five thousand barrels, or 2.5 percent of the daily California gasoline flow, can influence the forward price for gasoline.

The forward trading that does occur in California extends one month ahead, sometimes two months ahead, but almost never any further. Sometimes individual weeks are distinguished. For example, three weekly cycles (the “prompt,” two-week-forward, and one-month-forward cycles) traded in early September 2000 at different prices, as is illustrated in Figure 1. Prices for “prompt” shipment during the next week-long cycle on the pipeline are what OPIS and Platts report as the “spot

market price” of the day; those for more distant cycles are the reported forward prices. (Scheduling constraints on a pipeline make it impossible to obtain gasoline for same-day delivery, that is, a true “spot” trade.) Even those who do not trade routinely are aware of prevailing prices.

The nature of the gasoline forward market is heavily influenced by the logistics within California. As the principal pipeline operator, Kinder Morgan is flexible about the scheduling process, allowing rescheduling of delivery and substitutions of the recipient until one week before a cycle begins, at which moment the arrangements “freeze.” That flexibility up to one week ahead allows those who bought gasoline, but never truly wanted the physical barrels, to sell the piece later to someone else or to “roll” the shipment to a later cycle. Pipeline traders, along with the cargo traders (often a combined role), appear to be the primary bridge for price formation between prompt and forward markets in California gasoline.

Impediments to forward trading are not obvious. It seems anyone in the wholesale gasoline business – not many firms to be sure – can trade in the forward market. The impediment to new entrants is the same as in the spot market: the minimum transaction involves \$1 million. Although one default occurred several years ago, the market has not been plagued by the fear of defaults and bankruptcy. There are very few disputes over grade, quantities and delivery timing that plague other commodity markets. Nor does there seem to be the systematic imbalance, meaning far more willing sellers than willing buyers, that was thought to exist. As a result, there is much

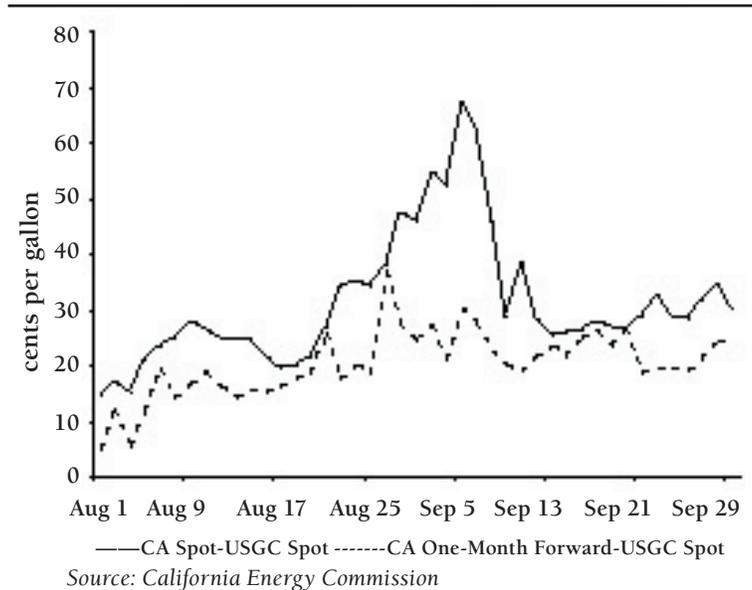
less scope for the State of California to set standards or to require buyers and sellers to include exclusions.

California as a Price Island

Increasingly, California is being treated as a price island. The California gasoline prices move in tandem with prices in other parts of the country, but the California price spikes are often much larger than those elsewhere. The effects of these price spikes are often felt in California, but not in other parts of the country. The California price spikes are often much larger than those elsewhere, and they are often sustained for a longer period of time. The California price spikes are often much larger than those elsewhere, and they are often sustained for a longer period of time.

The metaphor of California as a price island in gasoline needs some elaboration, nevertheless. First, because many environmental authorities endorse regional, cleaner-burning fuel programs, each with unique specifications, California is not the only island market for gasoline in the country. Presumably, local price spikes in other islands ripple through to California to some extent. No island is disconnected entirely, because crude itself can be redirected. Second, California is better thought of as two close islands, one served by the San Francisco Bay pipeline system and the other served by the Los Angeles system. Prices differ in these two locations within California, although not nearly as much as either California location sometimes differs from those elsewhere in the U.S. Third, the island metaphor includes the dimension of time as well as space. If California-specific specifications preclude gasoline coming from Seattle so it must come from farther away, the increase in distance alone implies that California gasoline prices must rise more than previously to attract imports. But that increased distance also implies that California must rely on local production longer, since shipments from farther away take longer to arrive.

As regards California's price spikes, the relevant comparison of spatial prices should allow for the time required for the shipment. The comparison of



spot prices in two distant locations, say California and the U.S. Gulf Coast as is Figure 2, is irrelevant for judging arbitrage possibilities suggested by prices in California being 60 cents higher than on the U.S. Gulf Coast. During late August and early September of 2000, this spot spatial spread was sustained well over the estimated import parity of 30 cents, largely due to disruptions in California refining and to California pipeline shipments. For the spot spatial spread to reflect import incentives, however, gasoline must be transported from the U.S. Gulf Coast within one day. No one can move gasoline on that route in less than two or three weeks. The relevant comparison is thus between the spot price on the U.S. Gulf Coast and the price relevant for the time taken in transit, namely the one-month-forward price in California. Over those days in August and September 2000 with a noticeable price spike, the California forward price minus the U.S. Gulf Coast spot price was within the range of 30 cents (or less) on all but one day, and just barely over 30 cents on that one day. According to Figure 2, any arbitrage opportunities were fleeting and were acted upon, since the differential closely approximated shipping costs. Indeed, a number of cargoes were sent to California during that period. Similarly, during other price spikes, the one-month forward price is almost always within 30 cents of the U.S. Gulf Coast price, whatever the relationship between the two regions' spot prices. During those periods, exports were sent on their way to California.

Most often when a spike occurs in the spot price of gasoline, the one-month-ahead forward price is substantially below the spot price, as is the constellation in Figure 1. This discount, of 10, 20, even 30 cents per gallon, does not measure the illiquidity in the forward market. The discount reflects the pressure for immediate delivery of gasoline. Because that pressure can be relieved in one month, no large premiums for California can be sustained many months forward. This explains both why California prices in Figure 1 converge to NYMEX New York prices and why distant California forward contracts are not actively traded. This premium for immediate delivery is a “backwardation” in the terminology of other commodity markets, where it is common even in the most active forward markets. That is to say, the gasoline forward market, as it exists in California, looks to display intertemporal price relationships much as do other forward markets.

Conclusions

The forward market in California neither functions poorly nor flourishes. A number of participants and prospective participants perceive the market as relatively illiquid, especially for the larger quantities associated with a tanker, some 350,000 barrels. If that illiquidity were converted to a cost, perhaps it would be between one and two cents per gallon. Although a higher transaction cost by an order of magnitude compared to active forward markets, one to two cents per gallon does not seem the principal impediment to shipments to California, compared to freight rates on the order of 20 cents from plausible export points, or the extra cost of producing California-specific gasoline, some five to seven cents.

From the observation that forward markets are delicate institutions, it does not follow that the absence of a forward market is necessarily indicative of some problem. Rather, the absence of the forward market may indicate that it is not needed because of features of the logistical and distribution system. Just as it makes little sense to have retail stations sell twenty-five different octane levels of gasoline – three seem to suffice – it makes little sense to expect active forward contracts for all conceivable delivery weeks. The forward market in California extends one month or so, which is the time necessary for most shipments from other regions to arrive in California. Logistical constraints within California are also on the order of one month. Schedules on the two principal

pipeline routes, one from Los Angeles, the other from San Francisco Bay, are settled within a month (namely, within four weekly cycles). In this logistical situation, the lack of two-month and higher maturity in California forward markets is neither surprising nor troublesome, given that other regions have active forward markets for gasoline.

State agencies weekly buy a quantity of gasoline (i.e., about one million gallons) on the order of one pipeline piece. An increase in volume of one piece per week would make some difference to the functioning of the forward market, since the daily volume is only a few pieces, but the state’s trading would be unlikely to transform the market. In any case, because the state agencies need gasoline at many locations (and in small amounts), the state itself could not disperse one pipeline piece. Yet more problematic, all the state’s procedures for procurement and inventory control exemplify the rigidity opposite to the flexibility needed for sophisticated trading in forward markets.

Thus, our study of the gasoline forward market revealed that no quick fix is possible because the state itself cannot provide a fix, and more fundamentally, because the forward market is not broken. This conclusion came as a disappointment to those concerned about the political repercussions of price spikes. Our study of gasoline forward markets further revealed a false premise behind this concern over price spikes. Many point to periods when the price of gasoline was much higher in California than elsewhere, much higher than the known costs of transportation, and imagined that such violations of arbitrage indicate a failure on the part of the marketing system. That comparison of spot spatial prices rests on the false premise that gasoline can move from far away to California within a day. The forward market’s prices, which allow for the necessary time for shipments, have accorded with arbitrage: The marketing system has been mitigating price spikes by attracting imports into California.

Jeffrey Williams is the Daniel Barton DeLoach Professor in the Department of Agricultural and Resource Economics at UC Davis. He can be reached by e-mail at williams@primal.ucdavis.edu. Jennifer Thompson is a Ph.D. candidate in ARE at UC Davis who can be reached by e-mail at thompson@primal.ucdavis.edu. Details of the study are available on the CEC Web site at www.energy.ca.gov/strategic_reserve/documents/index.html. The publication number is 2003-04-21_600-03-007D.PDF