Review of "Final Report on Direct Impacts Model (DIM) Analysis of the California Used Oil Market"

Brad R. Humphreys, PhD
West Virginia University, College of Business and Economics, Department of Economics
15 August 2013

Overview

The Direct Impacts Model (DIM) analyzes outcomes in the California used oil market. The DIM forecasts the sales of lubricant (lube) oil used in motor vehicles and industrial oil and the collection and recovery of used oil in California from the present until 2030. These forecasts are developed for a "baseline" forecasted outcome that forms the basis for a comparison of other potential forecasted outcomes, called "scenarios" in the DIM report.

The DIM model is implemented as an Excel spreadsheet. This spreadsheet allows the user to change the assumptions that make up the DIM model and see how these changes affect future used oil outcomes. The spreadsheet implementation of the DIM model is a useful tool. It is well designed and is relatively straightforward to use, if the user has basic familiarity with spreadsheets. The DIM model spreadsheet allows for the user to vary all of the key parameters and assumptions in this model. It is a comprehensive, flexible, and relatively powerful tool for analyzing possible future outcomes in California's used oil market.

The basic approach to analyzing outcomes in the California used oil market used in the DIM is to first forecast future activity related to motor vehicles and industrial demand for oil, and then to make assumptions about how much of this primary demand will be collected and recovered.

The primary assumptions about future primary demand in the California used oil market comes from other sources. The DIM Draft Report mentions data from "UCSB MFA" and "Kline." Since I lack access to these two sources, I cannot comment on the reliability or accuracy of these data. I note that the DIM Final Report contains almost no information about these sources.

Motor Vehicle Oil Use

The DIM estimates of the future recovery of used oil from the motor vehicle component of the DIM are based on several important assumptions. The first involves forecasting future vehicle miles travelled (VMT) in California. VMT is the basic measure of future use of lube oil, since the more vehicles on the road, and the more each vehicle is driven per year, the larger is use of lube oil in vehicles, other things constant. The DIM separates vehicles into four categories: autos/light vehicles, light trucks, single unit trucks and combo trucks. This approach is appropriate, since these types of vehicles use lube oil differently, and future use of these vehicles may differ systematically. Separating motor vehicles into different groups is an appropriate approach, and leads to better forecasts than using a homogenous motor vehicle classification. This also allows the DIM model to forecast future VMT in each category by applying a constant growth factor to the level of VMT in each category in California in 2011 for every year from 2012

to 2030. Again, this is an appropriate approach to modelling future VMT behavior. Also, in the spreadsheet implementation, assumptions about future growth in VMT can be changed in the DIM in order to determine how sensitive the final estimates are to changes in this assumption. This makes the DIM spreadsheet a powerful tool for users, since different stakeholders may have different ideas about future VMT in California.

After forecasting future VMT, the DIM also makes assumptions about how much lube oil will be used on average by each vehicle in each category (called "drain capacity" in the report), how often the oil will be changed in each vehicle (called the "drain cycle"), and a "drain cycle compound annual growth rate (CAGR)" which assumes that the frequency at which owners of vehicles will change their oil in the future will increase; in other words, in the future motor vehicle owners will decide to change their oil less often, and the interval will grow at a constant rate. The report acknowledges that these assumptions have a "major impact on the forecast for lube oil sales and the associated forecast for used oil collection and product recovery." The DIM allows all of these assumptions to be changed in order to assess the effect of altering these assumptions on the final estimates.

Economic Assumptions

The DIM analysis contains two key economic factors that may affect the estimates of future outcomes in the used oil market. First, the suppliers of used oil respond to economic incentives to provide used oil to the market. One factor that affects the amount of used oil supplied to the market is the price paid for used oil. The relationship between increases in the price of used oil and the increase of used oil supplied is the price elasticity of supply (PEoS in the Final Report).

Economic theory predicts that the higher the price paid to suppliers of used oil, the more used oil will be supplied to the market, holding other factors constant. In the context of the DIM analysis, future policy changes can be expected to change the price paid for used oil, so the relevant concept here is PEoS, since the DIM analysis depends critically on how much used oil is supplied by various lube oil users. The DIM analysis initially assume a prise elasticity of supply of 0.2, meaning that if the price paid for used oil increases by 10%, the amount of used oil supplied will increase by 2%. This parameter is adjustable in the DIM spreadsheet, so users of the spreadsheet can change the assumed PEoS and see how this affects future outcomes in the used oil market.

However, the DIM Final Report notes that the price of used oil increased significantly from 2007 to 2011, but the supply of used oil declined during this period. The Final Report notes "This trend contradicts the economic logic that an increase in the value of used oil should have increased the industrial oil collection rate." This is not entirely correct. Economic models predict that the used oil collection rate would increase if the price of used oil increased only if all other factors remain constant. It is likely that other factors not reflected in the price of used oil changed in California over the 2007-2011 period, and that the impact of these factors on the used oil recovery rate simply swamped the price effect. The DIM does not allow for non-price related economic factors to affect the rate of recovery of used oil. Users of the DIM spreadsheet should keep this in mind.

A second economic factor that affects the estimated future outcomes in the used oil market generated by the DIM spreadsheet is the effect of the price of substitutes for used oil on the supply of used oil in this market. Economists refer to this concept as the cross price elasticity of supply (CEoS in the DIM). The core idea is that the price of used oil relative to the price of substitutes for used oil will affect the amount of used oil supplied in the market. Fees and incentives will change this relative price of used oil, changing the relative market equilibrium quantities of used oil and "virgin oil counterparts" that are substitutes for used oil.

The DIM final report alludes to an equilibrium assumption when accounting for the effects of changes in the cross price elasticity of supply in this context. I found this explanation to be too brief, and not clear enough to assess the impact of this assumption. The report could be clarified in this area. The relevant statement is "The DIM methodology essentially assumes that recovery of re-refined base oil, MDO/light fuels, and RFO in 2013 reflects a market-equilibrium in the competitive substitution of each of these recovered products relative to virgin product counterparts." My reading of this is that the DIM assumes that the current ratio of quantities of the relevant oil products will only change if the fee and incentive changes analyzed in the DIM affect the ratio of prices; otherwise, the relevant price ratios and quantity ratios will remain unchanged. At minimum, the report should further clarify this point. Ideally, the report should also justify this equilibrium assumption. Oil markets are notoriously volatile, and the assumption that these markets are in equilibrium is strong.

Other General Comments

I generally find the Final Report to be well written and clear. The spreadsheet implementation of the DIM is a useful tool for investigating the effects of changes in policies and other key exogenous factors in the used oil market on future outcomes in this market. The Final Report contains appropriate caveats regarding the analysis. The discussion of data limitations is appropriate and useful. The discussion of the methodology used is clear and accurately reflects the spreadsheet implementation of the DIM.

At a number of points, the DIM Final Report notes that the analysis uses information from the "UCSB MFA" and "Kline data." These external sources are important for the DIM. Unfortunately, relatively little information is provided in the DIM Final Report about these external sources of data. In fact, only the names of the sources are listed. Since the results of the DIM depend on these sources, a complete assessment of the usefulness of the DIM requires more information about these sources than is currently provided. These may be regarded as authoritative data sources by people with detailed knowledge of the used oil market, or they may not be. Non-specialists have no context for making this sort of judgement. Providing some context for these sources of information would make it easier for a non-specialist to assess the quality of the DIM.

The various scenarios presented in the DIM Final Report seem to be comprehensive and appropriate. I am not intimately familiar with the scope of the policy debate taking place in California about the used oil market, but to an outsider these scenarios appear to represent most of the important potential policy changes that might be considered, and allow for an assessment

of the robustness of the forecasted outcomes to changes in the most important non-policy related factors that influence the forecasted outcomes generated in the DIM analysis. The spreadsheet implementation of the DIM makes it possible for other users to investigate in detail the sensitivity of the reported forecasts to almost any change in the DIM. Because of this, the reported scenarios in the Final Report represent only a tiny fraction of the alternative forecasts that could be generated by the DIM. This significantly enhances the usefulness of this report as an input to the policy making process.