2,000 New Medallion Taxicabs

- **Impacts on Traffic in the Manhattan Central Business District (CBD)**
- **Impacts on the NYC Taxi Industry**
- **Mitigations**

A paper in support of "More Taxis Mean More Traffic" — an op-ed essay published this week (Jan. 20) by Reuters.

By Charles Komanoff

on behalf of the Nurture Nature Foundation

January 23, 2012

www.komanoff.net 212-260-5237 kea@igc.org http://www.nurturenature.org/

[This document is on line at: <http://www.komanoff.net/cars_II/Komanoff_Taxi_Analysis.pdf>]

Introduction

The new taxi legislation hailed last month as promising "something for everyone" is more likely to bring something no one wants: more gridlock in the heart of the city.

That was the thrust of an op-ed article I published in Reuters on Jan. 20 (link: http://reut.rs/Ao501H). In brief, I concluded that embedding 2,000 additional yellow cabs in the Manhattan Central Business District, as the law mandates, will slow vehicle progress there considerably — by an estimated 12%, on average.[1] The lost time and productivity will, I calculated, consume the revenue windfall from the sale of the new medallions within two years. Long after that one-time infusion has run dry, these costs will remain, worsening the city's business climate and diminishing its quality of life.

This paper is written as a companion to my Reuters op-ed. It traces the analytical chain by which a mere 15% increase in the number of yellow cabs (from 13,237 at present, to 15,237 after the three-year phase-in) is projected to produce such dire traffic impacts. It also drills down to the micro level to estimate the damage that the additional medallion cabs will wreak on the taxi industry.

My analysis indicates that these costs will be severe. The number of fares (paying rides) that drivers can expect to garner in a typical 9-hour shift will fall by 6, on average — from 31 at present to 25 — a drop of nearly 20%. The impact on taxi drivers' take-home pay will be calamitous; likewise, the hit to medallion prices.

Modeling NYC Traffic

The interplay of travel into, out of and around New York City is staggeringly complex. Travel — literally, the totality of people in motion at any moment — is the sum product of millions of individuals' decisions, each of which depends not just on the characteristics of the available options but also on the choices made by everyone else. This is particularly true for car travel, since high levels of traffic congestion tend to discourage driving whereas low congestion encourages it. (Yogi Berra's lament about the nightclub that got so crowded that "no one goes [there] any more" applies to roads and bridges, too.)

These relationships and interdependences exist in a state of dynamic equilibrium. The most crucial ones can be represented in formulas and algorithms that capture the essence of individuals' decisions, collect them at the aggregate level, and feed the results back to the individual level. By combining these mathematical processes in a computer model, we can forecast the consequences of changing one or more characteristics of the transportation system. The change might be speedier subway service, or a congestion charge to drive into the Manhattan Central Business District. Here, it's an increase in the number of yellow cabs plying CBD midtown streets.

[1] The 12% figure applies to Manhattan roads, streets and highways south of 59th Street, averaged during 6am-6pm, weekdays. The impact averaged over all 24 weekday hours would be one percentage point less, i.e., 11%.

The model I used to analyze the impact of expanding the taxi fleet is one I developed under the auspices of Theodore Kheel,[2] the renowned attorney, mediator and civic activist who died in 2010 at the age of 96. Beginning in the 1960s, Ted recognized and wrote about the interrelationships between transit and traffic and advocated for policies that would balance the two. Ted's influence shows not just in the name he bestowed on the model — the Balanced Transportation Analyzer, or BTA — but in its architecture. The BTA is built around the potential interchangeability of trips between and among the various travel modes. Its spreadsheet "platform" also gives individuals much of the analytical capability heretofore invested only in proprietary models maintained by government agencies. (See concluding section of this paper, "Using the BTA Model," for a link to the spreadsheet.)

The BTA model expresses the ease or difficulty of shifting from one means of travel to another (e.g., from auto to subway, or from subway to cab, or vice versa) via coefficients, known as *elasticities*. These are derived from observing the extent to which past changes in trip costs or duration have provoked travelers to give up one mode and switch to another. Of course, the greater the increased or decreased expenditure of money or time, the more likely the shift.

The BTA's genesis lay in Ted's long-standing interest in implementing congestion pricing, which he identified as far back as the 1960s as a uniquely powerful instrument to discourage unproductive driving, reduce traffic congestion, and raise revenue to improve public transportation's performance, range and affordability. In 2007, Mayor Michael Bloomberg publicly embraced the idea of charging motor vehicles to drive into Manhattan when he made congestion pricing the heart of his *PlaNYC 2030* sustainability blueprint. Ted and I followed suit by designing a model architecture that divides the New York metropolitan region into two zones: (1) the Manhattan CBD (the portion of the island from 59th Street south to the Battery), and (2) everything outside, i.e., northern Manhattan, the four other boroughs, and outlying suburbs from which many car trips to the CBD originate.[3]

With this CBD orientation, the BTA model is well-suited to analyze not only congestion pricing but also the newly-legislated increase in medallion taxis, insofar as (i) yellow cabs have a legal monopoly on street hails in the CBD[4] and (ii) most taxi travel (an estimated 74% of the total[5]) takes place within the CBD.

Another salient feature of the BTA is its emphasis on the three main modes of travel into and within the Manhattan Central Business District: private automobiles, medallion taxis, and subways. The auto / taxi

---

[2] Wikipedia provides a capsule summary of Ted's career here: <http://en.wikipedia.org/wiki/Ted_Kheel>. My tribute to Ted on Streetsblog recounts his work in urban transport: <http://bit.ly/cWuexa>. Cornell University's ILR School has further biographical material: <http://bit.ly/z3pjUx>. The report Ted and I composed in early 2008, "Balancing Free Transit and Congestion Pricing," is available here: <http://bit.ly/ud4zux>.

[3] An estimated 43% of motor vehicle trips to or through the Manhattan CBD originate outside the five boroughs. For supporting data, see Row 187 of the Incidence worksheet of the BTA.

[4] The prohibition against vehicles other than medallion taxis picking up street hails actually extends well north of 59th Street — to Manhattan's East Side as far north as 96th Street, and the West Side to 110th Street.

[5] This figure is derived and displayed in Part C of the Taxis worksheet of the BTA.

/ subways "triad" is an important construct that helps keep the BTA model comprehensible and usable. The BTA also includes transit buses, commuter trains and trucks, but largely at a lesser level of detail than for private autos, subways and taxicabs.[6]

The High Profile of Medallion Taxicabs in the Manhattan CBD

The grim traffic predictions in my Reuters article are a bit startling. At present, 800,000 motor vehicles cross each day into Manhattan south of 59th Street. Why should a mere 2,000 additional vehicles throw traffic into such a tailspin that average travel speeds there fall 12 percent?

As always, the devil is in the stats. Medallion taxis account for only 3% of all vehicle miles driven in the city as a whole, but they make up more than two-fifths of CBD traffic.[7] Statistically speaking, this high fraction stems from the stark difference between the minutes and miles logged by taxicabs in the CBD vis-à-vis those of private autos that venture into the CBD at all. The typical private car driven into the Manhattan Central Business District covers less than 3 miles a day there.[8] In marked contrast, medallion taxis are driven within the CBD an average of 110-115 miles per day — 40 times as much as the average auto.[9]

Giving just one more vehicle a license to pick up street hails in Manhattan is thus tantamount to inviting 40 additional cars to drive into the city's center each day. The 2,000 new medallions authorized in the new legislation therefore equate roughly to 80,000 extra cars — a 10% increase in vehicle volumes in a traffic system that is already stretched beyond capacity for much of the day, including, by definition, during long "peak" periods in which the number of vehicles impacted by traffic is at its highest.

Modeling the Traffic Impact

---

[6] The BTA's limited treatment of pedestrian and bicycle traffic deserves comment here. On the one hand, current levels of walking and cycling are reflected in the model's baseline travel speeds, insofar as those are affected by walkers' and cyclists' presences on CBD streets. Moreover, the inclusion in the BTA of a parameter denoting "lane-miles repurposed from autos" gives it the capacity to produce a first-order estimate of the impact on travel speeds of appropriating road space for bicycle lanes. Nevertheless, the model does not now have the capacity to estimate the extent to which the bicycle trips attracted by those lanes come from other modes; not to mention the impact of exogenous policies that might raise the mode shares of walking and/or bicycling (e.g., wider sidewalks; enforcement of traffic laws intended to safeguard right-of-way of walkers and cyclists; the new bike share program scheduled for startup later this year).

[7] Medallion taxis are driven an estimated 2.03 million miles daily (on weekdays and weekends alike), for annual VMT (vehicle miles traveled) of 741 million. See BTA spreadsheet, Taxis tab, Part H. Total NYC motorized VMT in 2005 was 24.1 billion, a figure that has probably changed little since then. See BTA spreadsheet, VMT worksheet. The taxi share of citywide VMT is thus 3%. For taxis' CBD fraction, see Motor Vs tab, Row 101. Columns L and H show, for a typical weekday, 1.41 million CBD miles traveled by medallion taxis, and 3.43 million CBD miles for all motor vehicles combined. The taxi share in the CBD is thus 41%.

[8] Auto trips to the Central Business District are assumed in the BTA to consume an average of 2.5 miles within the CBD (arriving and leaving combined). For "through-trips" that pass through the CBD, e.g., from Brooklyn to New Jersey and back again, the assigned figure is slightly higher, 3.2 miles, reflecting longer cross-Manhattan distances.

[9] Multiplying medallion taxis' 2.03 million miles per day (see earlier footnote) by 74% (the CBD share of taxi miles driven) and dividing by 13,237 (the number of medallion taxis) yields 113.5 miles per taxi per day.

In projecting a 12% deterioration in CBD travel speeds from adding 2,000 taxis, the BTA incorporates a number of conservatisms, i.e., factors that work to moderate the traffic impact. These include:

- The expectation that the increase in traffic will "crowd out" some car trips, i.e., discourage people with access to cars from using them for all or some trips;
- The expectation that the increased ease of flagging down a cab (now that there will be more of them) may lead more New Yorkers to "leave their car at home";
- The tendency of taxi usage to be concentrated later in the day or night than car and truck traffic, which would allow the jump in taxi traffic to be more easily absorbed.

The BTA's inclusion of these factors doesn't mean that the model perfectly replicates reality; rather, it attests to the model's sophistication, and to the seriousness of its effort to portray the complex interactions that constitute travel in New York City as realistically as possible. Certainly, the model's result, that weekday traffic speeds within the CBD during 6am-6pm will decrease by 12% on average, "falls out" of the model rather than being programmed into it.

Taxi Industry Impacts

Increasing the number of taxi medallions by 15% should reduce the number of fares *per cab* by 13%,[10] *ceteris paribus*, i.e., barring some other change that would expand the pie (the total number of taxi trips) and thus mitigate the increase in the number of slices (medallions). What might these changes be?

The most obvious candidate is the increased ease of hailing a cab; with more cabs in service, more cabs will be passing by any particular point where and when people are looking for a taxi. Moreover, a greater proportion of these cabs should be empty (cruising) because the same population of taxi riders (more or less) will be spread among more taxis. The combination of these factors means that more medallions should shorten the time it takes to hail a cab; this in turn would increase ridership by increasing the "utility" of taxi travel, that is, making it more efficient for riders.

My BTA model assigns an average time of nearly five-and-a-half minutes to hail a cab on weekdays; the weekend figure is around a minute less, because lesser traffic levels on Saturday and Sunday allow taxi trips to turn over more frequently. With more medallion taxis, these average "hail times" should fall considerably.

Somewhat undercutting this effect is the fall in travel speeds for taxis and other vehicles, due to the increase in traffic resulting from the presence of the additional cabs. With CBD trips taking more time, some of the increased number of empty taxicabs won't be available to hail because they are being slowed by increased traffic. Still, the predicted net reduction in hail time is impressive: a little over a minute on weekdays, a little under a minute on weekends.

Unfortunately for the taxi industry, the projected reduction in hail time due to the increase in cabs is likely to be largely offset by the increase in "in-cab" time per trip, caused by the same overall slowing of traffic. The BTA projects that in-cab times will rise by a minute on weekdays, with a somewhat smaller

[10] The expected decline is 13%, not 15%, owing to the fact that the reciprocal of 1.15 is 0.87, and not 0.85.

rise on weekends. This means that *the boost in taxi use from the reduced hail times is likely to be cancelled by the greater time expended in the taxi trip itself.*

These cross-cutting factors are collected in Table 1:

Table 1: Impacts of Adding 2,000 Taxi Medallions (results for weekdays)

	Current Conditions	Add 2,000 medallions	% Change
Number of medallions	13,237	15,237	+15.1%
Average CBD travel speed, mph	9.5	8.4	-12.1%
Average in-cab travel time, minutes	13.8	14.8	+7.5%
Average hail time, minutes	5.4	4.2	-21%
Total taxi journey time, minutes	19.2	19.1	-0.5%
Taxi trips per day	471,200	472,000	+0.2%
Taxi trips per shift	28.8	23.3	-19%

All figures are in or calculated from Taxis worksheet of BTA spreadsheet , except as noted here. Current conditions assume 1.19 shifts per day per taxi. Trip times are the weighted average for all taxi trips, not just in CBD. Average CBD travel speeds apply to all CBD traffic, 6am-6pm. Current speed average is based on 2010 NYCDOT data, as discussed in BTA Motor Vs worksheet tab. "Added" speed figure is calculated by Komanoff in same worksheet tab. Percentage impact on in-cab travel time is less than the percent change in CBD speeds because taxi travel is more concentrated in off-peak times.

The picture for weekends is similar.[11] Weekend taxi trips per shift fall from 36.7 now, to 29.9, an 18% drop**. On a 365-day weighted basis, the number of fares per shift, now 31.3, falls to 25.4, a decrease of 19 percent.**

This 19% average drop in fares per shift can be parsed as follows:

- Fares per shift fall by 13% because 2,000 more taxis are carving up the same ridership base.[12]
- Fares per shift fall another 5-6% because the slowdown in CBD traffic makes trips take longer.
- The ridership base does not expand, despite the reduction in hail time, because the incentive to travel by taxi is offset by the increase in taxi trip duration.

(Note that we assume no decrease in the number of shifts per day for each medallion taxi; if anything, the lesser revenue per shift would lead owners and drivers to add shifts, which would exacerbate the traffic impacts and cut even further into ridership.)

Precisely how this will affect the economics of taxicab ownership, leasing and driving is beyond the scope of this paper. Nevertheless, it seems incontrovertible that a nearly 20% drop in per-shift revenues

[11] The average number of medallion taxi trips on weekends is essentially the same as that on weekdays. According to TLC data logs for the entire sample month of March 2009, compiled by the cab-sharing Web-app company Faresharenyc.com, and generously shared by them, weekday taxi boardings averaged 469,000, and weekends 462,600, a difference of less than 1.5%. In the BTA model, we elected to assign the same number of fare trips to all 365 days, which we did by dividing annual trips in 2005 of 172 million (from Bruce Schaller's final "Taxi Fact Book," published in 2006), by 365 days.

[12] Recall earlier footnote with arithmetic explaining that share sizes fall 13% when the number of shares rises 15%.

would be disastrous for the medallion taxi sector. Indeed, the presence of fixed costs (for maintenance, garaging, insurance, etc.) suggests that any decline in "marginal" revenue will cut disproportionately into wages and profits. Similarly, the expectation of severely shrunken future earnings will depress medallion prices, probably considerably. While a taxi fare hike would soften the blow (since demand for taxi services is relatively price-inelastic), it would probably need to be massive to fully offset it.

How Did Past Medallion Sales Affect Traffic?

The nearest precedent for the pending 2012-2014 sale of 2,000 medallions was the auction of 900 medallions in 2004-2006. That sale increased the number of medallions by 7.4%, or around half of the 15.1% rise from the pending sale of 2,000 treated here. The BTA model predicts that a 7.4% rise in the number of medallion taxis should have caused CBD travel speeds to fall 6% — half of the 12% decline projected for the 2,000 new medallions.[13]

Data on changes in CBD travel speeds during 2004-2006 could confirm our modeling approach and validate the projections here for 2012-2014. Unfortunately, consistent annual data for that period aren't available. Nevertheless, the impression is strong that traffic congestion did not ease during that period and may have gotten worse. Certainly, the intractable nature of Manhattan traffic was a constant topic of discussion at that time, and it is probably unlikely that Mayor Bloomberg would have promulgated his April, 2007 congestion pricing plan, had not traffic in the Manhattan core been an ongoing concern of business interests and other stakeholders. (On the other hand, it must be noted that the advent in 2003 of London's congestion charging scheme contributed heavily to interest in congestion pricing here.)

It is also possible that improvements in public transportation may have attracted enough travel from autos and taxis to mask some of the increased taxicab traffic. subway ridership rose steadily in that period, with increases of 42 million in 2004 (a gain of 3.0%), 23 million in 2005 (1.6%) and 50 million in 2006 (3.4%). To some extent, these increases were a legacy of long-term service improvements as well as innovations such as unlimited-fare Metrocards that probably cut into demand for taxis by reducing the cost of incremental bus and subway trips to zero for participating riders.[14] Mass transit's increased attractiveness may also have blunted the traffic impact from expanding the medallion-taxi fleet, by taking on some of the travel load from private cars. Indeed, Bruce Schaller, NYC Deputy Transportation Commissioner for Planning and Sustainability since 2007 and, earlier, a highly regarded transportation analyst and consultant, was already writing in 2005 of "a fundamental shift from auto ownership to subway ridership."[15]

---

[13] To capture the impact of a 7.4% increase (900 additional over a 2004 base of 12,187), I inputted 980 new medallions, rather than 900, into today's BTA medallion figure of 13,237.

[14] The MTA began selling unlimited ride Metrocards in July 1998 for 7 and 30 day passes. Use of unlimited Metrocards reached 43.2% of all trips by 2001. Still, the persistence of negative stereotypes about public transit would suggest that some taxi and auto travelers might have been slow to switch some of their travel to transit.

[15] Bruce Schaller, "Fewer Cars (Same Traffic)," Gotham Gazette, March 18, 2005, available at <http://bit.ly/xsg67T>. Schaller also reported that, "On the margin … more people are plunking down money for their Metrocards than for their vehicle registrations."

Is There a Way Out?

Even if a shift to transit did help stave off gridlock from the addition of 900 medallion taxis in 2004-2006, no one should look to transit today for a repeat performance. For one thing, some bus and subway service was cut in 2010, and the MTA's fiscal situation has since worsened; the latest blow is the Dec. 2011 tax overhaul that will shrink the Payroll Mobility Tax by an estimated $250 million a year, beginning April 1. Meanwhile, four fare hikes in five years have reduced growth in transit use, and another fare increase is set for January, 2013. Budgetary pressures have also forced the MTA to scale back its capital program; this will delay upgrades to signals, tracks and rolling stock and make it less likely that transit can rescue the city from taxi-induced gridlock for a second time.

What about adding street capacity? The BTA model indicates that the extra traffic from selling 2,000 medallions could be absorbed by creating 75 new "lane-miles" within the Manhattan CBD. Needless to say, that kind of increase, amounting to an 8% expansion in the CBD road network, isn't physically feasible, at least without destroying much of Manhattan's walking and bicycling infrastructure.

Fortunately, there is a way to keep traffic moving, or at least avert a disastrous slowdown, even with more yellow cabs and without turning over bike lanes and sidewalks to automobiles. And that is congestion pricing.

Congestion Pricing Redux

As I noted in my Reuters op-ed, the idea of charging cars to enter Manhattan south of 60th Street fell off the policy map in 2008 when the Bloomberg congestion pricing plan died in the state legislature. Yet the merits of tolling cars driven into the CBD remain obvious. Two plans for resuscitating congestion pricing are currently being advanced, and both seek to cast a wider net, politically, than the Bloomberg plan.

One plan has been crafted by Sam Schwartz, the transportation engineer and former City traffic commissioner known as Gridlock Sam and renowned for his vernacular feel for city traffic. Schwartz's "Fair Plan" would charge $5.00 to drive an automobile into the Manhattan Central Business District at all times, and another $5.00 to drive out. In a bold move to neutralize opposition to congestion pricing among car-owning city residents outside Manhattan, Schwartz would dedicate a portion of the congestion revenue to *reduce* tolls now charged on MTA bridges such as the Verrazano-Narrows and Throgs Neck. Unlike the East River bridges, which have been un-tolled for a century, the MTA crossings do not deliver cars into Manhattan's congested heart; nor are there attractive transit alternatives to driving on those bridges.

The other plan is my own. It originated with Ted Kheel and subsequently was honed by a coalition of civic groups known as Move NY. Like Schwartz's Fair Plan, the Move NY Plan would charge all motor vehicles driven into the CBD, though at lower rates during non-peak hours and on weekends. The plan incorporates Schwartz's discounts on MTA bridge tolls, albeit at a lower rate, and adds a toll exemption for any vehicle's first trip into the CBD in any month. The Move NY Plan also exempts yellow cabs from the congestion toll while surcharging each trip, including their wait-time meter charge, as a way of "capturing" their congestion costs.

Either plan would net a billion dollars or more each year — easily enough to offset the MTA's lost payroll tax revenues and also let the MTA substitute hard dollars for debt financing for a large piece of its capital program. And, my modeling suggests, either plan would diminish private-car use sufficiently to absorb the 2,000 new taxi medallions without slowing down traffic.

Table 2: Mitigating the Addition of 2,000 Taxi Medallions with Congestion Pricing

	No pricing	Fair Plan (Schwartz)	Move NY Plan (Komanoff)
Change to average CBD travel speed	-12.1%	+8.6%	+4.4%
Change to taxi ridership	+0.5%	+8.2%	+5.7%
Change to taxi fares per shift	-19%	-3.6%	-7.5%
Net revenue made available	+$100,000,000 / yr	+$1,240,000,000 / yr	+$1,040,000,000 / yr
Societal net benefit	-$650,000,000 / yr	+$2,320,000,000 / yr	+$1,780,000,000 / yr

All figures are in or calculated from Taxis, Results and Cost-Benefit worksheets of BTA spreadsheet. Changes in CBD travel speeds apply to all CBD traffic, 6am-6pm weekdays. Revenue gains reflect discounts noted in text, as well as toll administration costs and payments to MTA and PANYNJ to offset their lost revenue from reduced throughput at tunnels to the CBD. Societal net benefits incorporate travelers' time savings (or debits), environmental benefits (or costs), lost amenity for trips "priced out of cars" by congestion charges, and user payment of those charges. Net revenue and societal net benefit figures for No pricing option amortize anticipated $1 billion revenue from medallion auctions over 10 years.

As Table 2 shows, either congestion pricing plan would blunt the negative impacts on CBD traffic and the taxi sector from introducing 2,000 new taxi medallions. Instead of a 12% decline, CBD travel speeds would rise, by nearly 9% with the Schwartz Fair Plan and by more than 4% with Komanoff's Move NY Plan. Thanks to that improvement from congestion pricing, taxi ridership grows by 6-8%; this limits the decline in the number of fares per shift to a potentially manageable 4-7%, versus falling by 19% without congestion pricing. While the Schwartz Plan delivers more revenue and traffic improvement than the Komanoff Plan, the real takeaway is that *either congestion pricing plan largely solves the problems presented by expanding the medallion taxi fleet*.

The bottom row of Table 2 indicates that adding 2,000 medallion taxis will impose net costs on New Yorkers of nearly two-thirds of a billion dollars a year (assuming a ten-year amortization of the $1 billion in revenue that the authorities are anticipating from the auction), primarily in travelers' lost time. Conversely, implementing either congestion pricing plan *in conjunction with* the medallion sale would turn this loss into a large gain, with projected net benefits in the neighborhood of $2 billion a year.

References

The legislation whose traffic impacts are analyzed here is **S6118-2011: Authorizes NYC to issue new taxicab licenses to vehicles that are accessible to individuals with disabilities**. The text is available at this link: <http://open.nysenate.gov/legislation/bill/S6118-2011>.

A table summarizing Komanoff's Move NY Plan is available at this link: <www.komanoff.net/cars_II/Move_NY_Plan.xls>.

Using the BTA Model [I have altered this section slightly to reflect changes to the BTA. — C.K., 20-Aug-12]

Readers who wish to "peer under the hood" of the BTA spreadsheet model may download it by clicking on this link: <http://www.nnyn.org/kheelplan/BTA_1.1.xls>. You must have Excel 2007 or later to run it.

The BTA has 59 worksheet "tabs," or "pages." Although you can navigate among them via the tabs at the bottom of the active window, it's simpler to go to the **Index** page (tab #2), locate the page you want in the list of worksheet tabs, and click on the link for that page.

To duplicate the entries in Tables 1 and 2, first go to the **Results** tab and examine the block of text in Cell I25. It has been pre-set to the "Gridlock Sam Fair Plan," meaning that key parameters for that plan, including congestion charges, have been entered into dozens of cells throughout the BTA that pertain to toll levels, transit fares, transit spending, and other policy "levers."

Now, click on that text block in Cell I25. A pull-down menu should appear, with 6 choices. Click on the top (first) choice, "Baseline." This selection will reset the key parameters to current (2010-2011) traffic and revenue conditions. After a moment or two of automatic Excel recalculations, all of the cells in this worksheet (**Results**) should read zero.

Now go to the **Taxis** worksheet. Use the link in Cell B22 ("More Medallions") to go to Section M, "Parameters for Assessing Impact of Adding Additional Medallion Cabs to the City's Yellow Taxi Fleet." Toward the bottom of this section, you should see a cell with the number zero, next to a label, "Numerical Change in Medallions." Click on that cell and enter 2000. This will "input" the 2,000 new medallion taxis in addition to the 13,237 medallions now in circulation.

Now return to **Results**, and view the impacts of these additional taxis on key indicators — most notably, "Change in avg vehicle speed …" in Cell H11. It should read negative 12.1%, corresponding to the 12.1% average drop in CBD weekday travel speeds that I have referred to throughout this paper.

Staying in **Results**, If you now go back to the large Cell I25 and click on the pull-down menu, you can substitute the Move NY Plan (menu option #3) or the Gridlock Sam Fair Plan" (option #5) for the Baseline "plan." This will generate the revenue and travel-speed results shown in Table 2 (or close to those values).

With any of these options selected (#1, Baseline; #3, Move NY; #5, Gridlock Sam), you may return to the **Taxis** worksheet tab and see other results noted in the two tables. Part J, "Change in Number of Fares Per Cab (per hour and per shift)" is particularly salient.

About Charles Komanoff

Komanoff is an activist, economist and policy-analyst. He directs the Carbon Tax Center and develops traffic-pricing modeling tools for the Nurture Nature Foundation. A prolific writer, Charles's output includes books, scholarly articles, journalism and landmark reports such as *Power Plant Cost Escalation*, *Killed By Automobile*, and the *Bicycle Blueprint*. A math-and-economics graduate of Harvard, Charles lives with his wife and two teenage sons in lower Manhattan. For links and more, go to www.komanoff.net.