

## Treasury's Bank TARP Warrants: Why Jamie Dimon is Right.

A recent report by the Congressional Oversight Panel ("COP") states that the US Treasury is allowing banks to repurchase their TARP equity warrants at "only 66 percent of its [the panel's] best estimate of their value".<sup>1</sup> As a former Wall Street equity derivatives trader, I found this to be a very specious assertion. While one can readily observe thousands and thousands of prices for stock options across the US's listed markets, currently such options generally do not have expiration dates past January of 2011, whereas the Treasury options expire on October 31, 2018. Although over-the-counter ("OTC") markets extend further into the future, dealers generally do not quote past 5 years on most single stock equity derivative products. Thus, owing to a lack of similar observable prices for the Treasury's warrants, the process of estimating two extremely important option pricing parameters, expected future volatility and dividend payments, becomes a very uncertain one. Hence, any argument over the "fair value" of the Treasury warrants is rendered a highly subjective one.

Although the COP's paper and academic studies argue that one can generate much higher estimates of "fair value" than what the US Treasury has received thus far, I would argue that the only true "fair value" for these warrants is what a Wall Street equity derivatives trader would be willing to pay to purchase these bank TARP warrants and risk manage them until their maturity. To be sure given the substantial uncertainty over estimating expected volatility and dividend payments through 2018, such derivative dealers would apply hefty discounts to these two factors, in order to protect their chances of being able to profitably risk-manage these warrants over their remaining 9+ years of their life. Hence, according to my analysis, ***it would seem that the US Treasury has been setting very realistic prices for its TARP warrant repurchase program thus far.***

To further bolster this argument, when the Wall Street Journal reported on Wednesday, July 13<sup>th</sup>, that JP Morgan's CEO Jamie Dimon had waived the bank's right to repurchase the warrants arguing that the US Treasury wanted too much for them, I knew something was very wrong. I had the opportunity to meet with Mr. Dimon in Tokyo after Travelers Group had purchased my old firm Salomon Brothers. I was running Japanese equity derivatives trading at the time and as such had a chance to have a brief meeting with him to explain the risks in our derivative trading books. Based on my discussions with Mr. Dimon, I can assure the reader that he understands the pricing of equity derivatives quite well and that his equity derivatives traders at JP Morgan are among the best in the business. ***Hence, if Jamie Dimon believes that the Treasury is asking too much for its warrants, then there has to be a very good argument for his assertion.***

### Volatility and Dividends

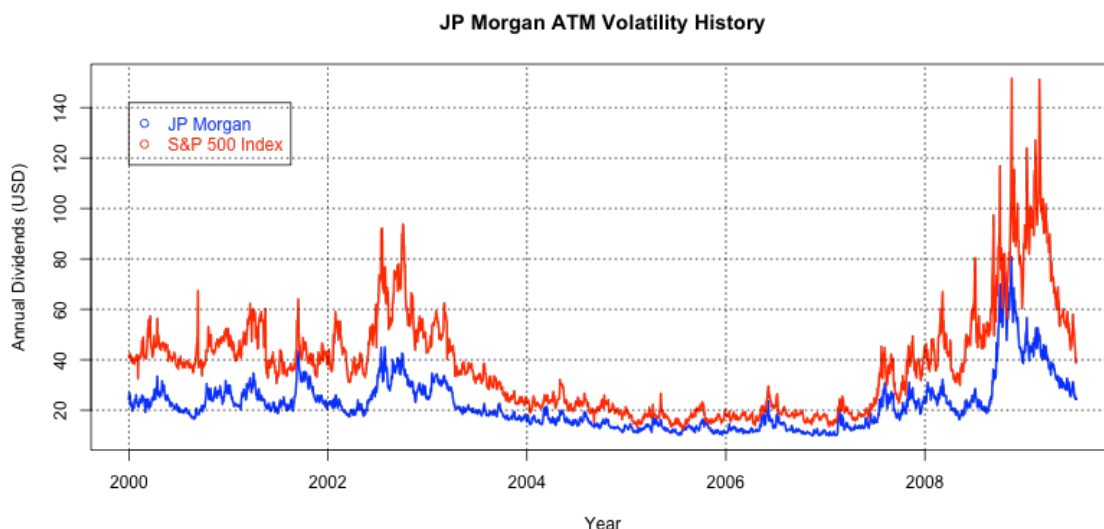
Although the COP has gone to great lengths on estimating "fair values" for these warrants, including conferring with many noted academics in the field, they seem to have neglected to consult with an actual practitioner from the equity derivatives business to determine whether their assumptions are indeed "reliable". Without going into the mind-numbing details on the methodology of pricing equity options, the basic issue is that of the six determinants of a stock option's "fair value", in this case four are known with certainty, while the remaining two, expected future dividends and volatility of the bank stocks, are highly uncertain ones.

### Stock Option Pricing Inputs

Pricing Input	Characteristics	Tradeable/Hedgeable
Stock price	Known	Yes, subject to borrowing constraints and short sale constraints.
Strike price	Fixed	Not applicable.
Time to maturity	Fixed	Not applicable.
Interest rates	Known	Yes.
<b>Dividend yield</b>	<b>Unknown</b>	<b>Only through listed options or OTC swaps/forwards.</b>
<b>Volatility</b>	<b>Unknown</b>	<b>Only through listed or OTC options and/or variance swaps.</b>

<sup>1</sup> See page 4 of the Congressional Oversight Panel's, "July Oversight Report: TARP Repayments, Including the Repurchase of Stock Warrants", July 10, 2009.

While estimating expected dividends and volatility over a 10-year horizon is normally an extremely difficult undertaking, it has been rendered even more difficult by the turmoil in the financial markets over the last year.



With respect to estimating future volatility, one needs only to look at the VIX Index and the at-the-money (“ATM”) implied volatility of JP Morgan over the last decade. While the VIX index traded in a 10-40% range prior to the bankruptcy of Lehman Brothers last September, the market witnessed VIX rise to as much as 80% last year. Similarly one-month JP Morgan stock option implied volatility has traded in a 35-100+% range over the last year. Given such high levels of recent volatility, historical measures of volatility are likely to be elevated versus what the market may actually realize in the future. Thus, equity derivative dealers are likely to apply a hefty discount to any historical estimate of volatility and even to current implied levels, as VIX index volatilities are starting to return to 20% level rather than maintaining a 40-80% range.

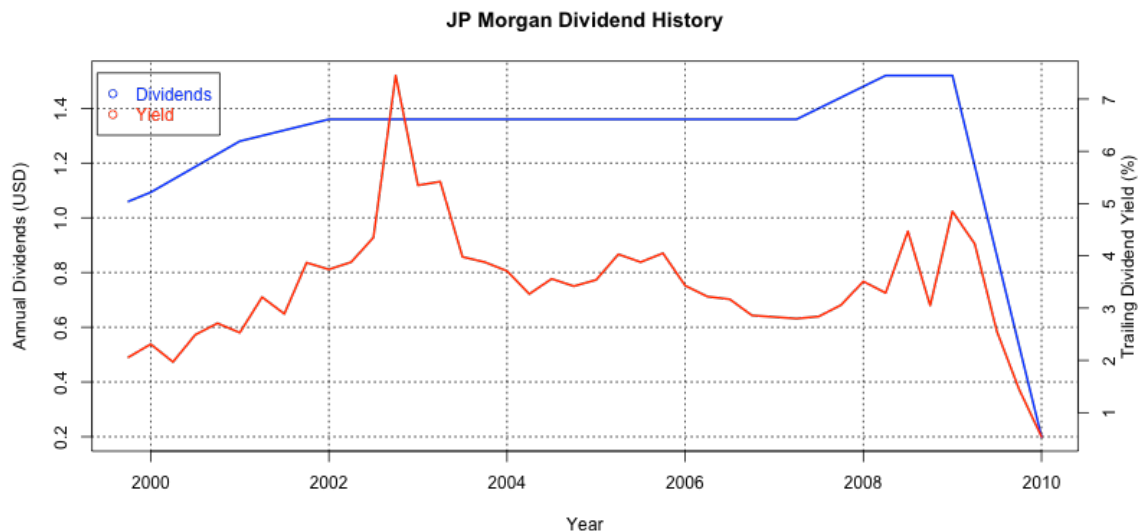
For example, on the July 6<sup>th</sup> date of the COP analysis, the January 2011 40 and 45 strike call options on JPM were trading with implied volatilities of 42-45%. Judging from the COP’s report, it would seem that they assumed approximately a 42.5% volatility to produce a “Best Estimate” of \$1.02 billion for the TARP warrant. This would be fine assuming a one only had a few hundred options to sell, but the JP Morgan warrant is struck on 88.4 million shares or the equivalent of nearly 900,000 listed stock options. In order to be willing to step up and buy all of these warrants, a derivatives dealer would require at least a 5-7% point volatility discount. My best guest of a fair volatility would have been 35%, which was nearly 20% below the COP’s fair value estimate. Further, as a result of last week’s equity market rally or expectations of these warrants coming to auction, the implied volatilities of the 40/45 Jan 2011 strikes have now fallen by at 5+ volatility points to 38-39%. Thus, I would argue that the dealer bid for all of the warrants would now be as low as 30%.

Pricing Input	Linus Wilson	COP	Realistic	
			Dealer Price	Dealer Price
Valuation Date	June 10, 2009	July 6, 2009	July 6, 2009	July 21, 2009
Stock Price	34.84	32.60	32.60	36.85
Dividend Yield	0.57%	2.50%	2.50%	2.50%
Volatility	52.89%	42.50%	35%	30%
Warrant Price	19.90	11.54	9.44	10.12
Warrant Value (USD Millions)	1,759	1,020	835	895

With respect to estimating dividend yields, all of the TARP banks were forced to sharply slash their dividends. For example, up until April 6, 2009, JP Morgan had been steadily paying 0.32-0.38 per quarter since 1999, whereas now it only pays 0.05 per quarter. Following TARP repayment and with

an improving economy, one would expect to see bank dividend payments to increase again. However, the question remains, "By how much and when?" This uncertainty over expected future bank dividends has a enormous influence on option pricing for long-dated equity derivative contracts, as the difference between 10-year interest rates and the expected dividend yield is what determines the future expected forward price of the stock at maturity and hence the expected warrant payoff. This effect on the forward price of a stock by the expected dividends become a very dominant determinant input in pricing long-dated stock options.

For example, a rise from 2.5% to 3.5% in JP Morgan's expected dividend yield would drop the warrant's price by roughly \$1.50, which is the equivalent of a 5 point drop in expected volatility. Thus, a derivatives dealer would be likely to use a higher dividend assumption in order to protect against the risk of the return of JP Morgan's dividend rate back to its recent highs of as much as 7%, thereby depressing the warrant prices even lower than the estimates in the table above.



### Realistic Warrant Pricing

By incorporating these volatility and dividend adjustments, I find that the value of the ten largest warrant positions of the banks (page 26 of the COF report), is not the \$6.33 billion that the COF estimates, rather an aggregate value to be more likely in the range of \$4.4-5.3 billion or a 16-30% discount relative to the "Best Estimate" of the COP's report. ***Thus, perhaps the US Treasury repurchases are nearly exactly in line with what they might receive under an auction of the warrants to third parties.***

Institution	COP Estimate	Derivative Dealer		Discount to COF Estimate	
		Realistic	35% Volatility	Realistic	35% Volatility
Bank of America	1,130	1,021	831	-10%	-19%
JP Morgan	1,020	836	838	-18%	0%
Wells Fargo	1,020	802	669	-21%	-17%
Goldman Sachs	940	703	704	-25%	0%
Morgan Stanley	870	731	681	-16%	-7%
Ciitigroup	560	587	137	5%	-77%
American Express	300	253	217	-16%	-14%
PNC Financial Services	190	144	140	-24%	-3%
Bank of New York Mellon	160	136	136	-15%	0%
Capital One Financial	140	67	52	-52%	-22%
<b>Totals</b>	<b>6,330</b>	<b>5,280</b>	<b>4,404</b>		
<b>Variance to COP "Fair Value"</b>		<b>-16.6%</b>	<b>-30.4%</b>		

### **Other Issues: Liquidity, Auction Hedging and Dividend Swaps**

In addition to the uncertainty in estimating expected volatility and future dividends as mentioned above, there are a number of other issues, which could have further depressed the repurchase prices of the 11 repurchased warrants on page 27 of the COP's report. Most of these stocks lack liquid options markets, which makes the estimation of volatility even more challenging. Additionally, the COP report ignores the fact that if the warrants were sold to a third party via an auction, that the dealer derivative would have to short shares equal to 40-60% of the warrants outstanding. The affect of this would be manifold: 1) As the warrants represent 1-5% of shares outstanding, this hedging pressure would lower the share price of the stock and hence lower the repurchase price of the warrant to Treasury. 2) Such large amounts of stock may not be borrowable by dealers and hence a purchase of the warrants could not be accomplished and 3) The size of warrant re-hedging pressure in many of the 11 banks would collapse future volatility, thereby further lowering the "fair value" of the repurchase price.

However, there is one idea that the COP could advocate in order to improve repurchase prices for the TARP warrants. Given the extreme uncertainty over expected dividend payments, the Treasury could simply enter into a dividend swap struck at what the COP considers to be a "fair level". If the banks pay more dividends than expected, then Treasury would pay the third-party warrant buyers the difference and conversely, if dividends are less than expected, the dealer would pay Treasury the difference quite happily, as the value of the warrants would increase owing to lower dividends.

### **Conclusion**

The COP's "Best Estimate" of the value of US Treasury TARP warrants likely overstates the aggregate value of the warrants of the ten largest banks by 16-30%. Similarly, their assertion that the Treasury has been paying "only 66%" of the "fair value" is also incorrect owing to variety of factors under a realistic scenario where a Wall Street dealer would purchase and hedge out all of the various risks over the remaining life of the warrants. At the end of the day, the banks are the natural buyers for the warrants, as a repurchase would eliminate potential future dilution and limit their repurchase costs to reasonable levels, as many of the stocks are trading below their strike prices currently. Although the COP's suggestion of an auction process for the warrants is a well-meaning one, it ignores the required short selling hedging pressure, which a third-party will place on the stock in order to eliminate price risk. For example, in the case of JP Morgan, this will translate into roughly 40 million shares of the stock to be short-sold, which will clearly depress the stock price and in turn reduce the warrant repurchase price for US taxpayers. ***Finally, one could argue that the best deal for US taxpayers would be for Treasury to simply to hold onto the roughly \$40 billion of warrants on US TARP participants, as a doubling in bank stock prices over the next decade will yield multiples of the handful of billions to be gained from repurchases currently.***