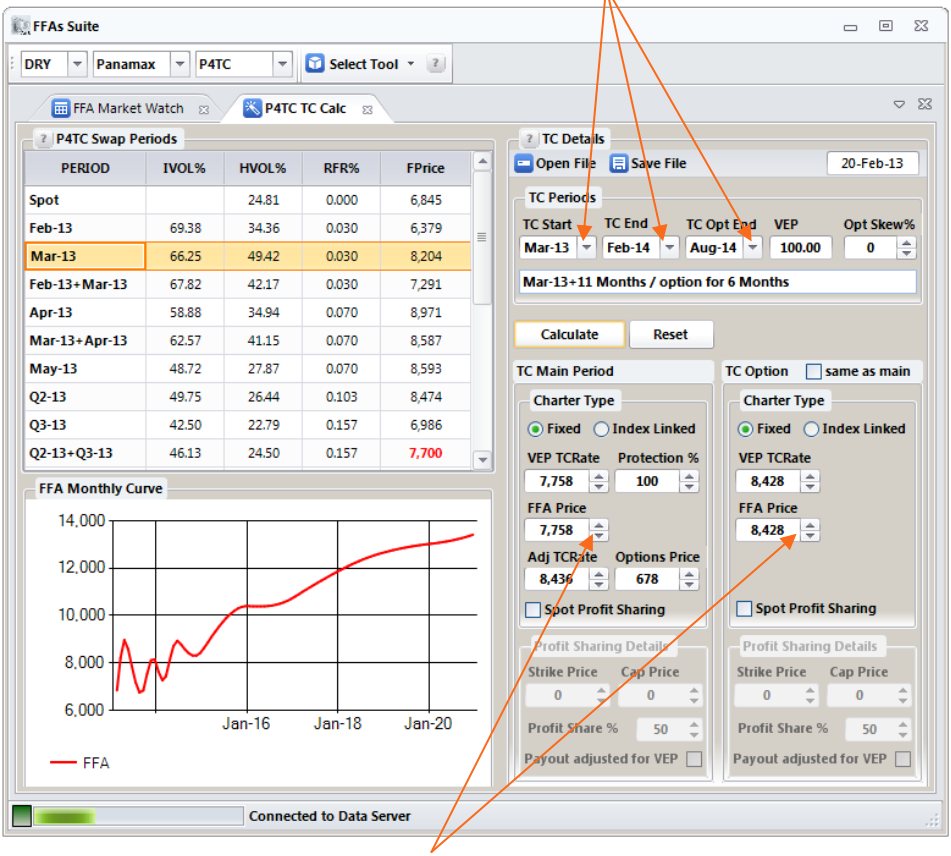
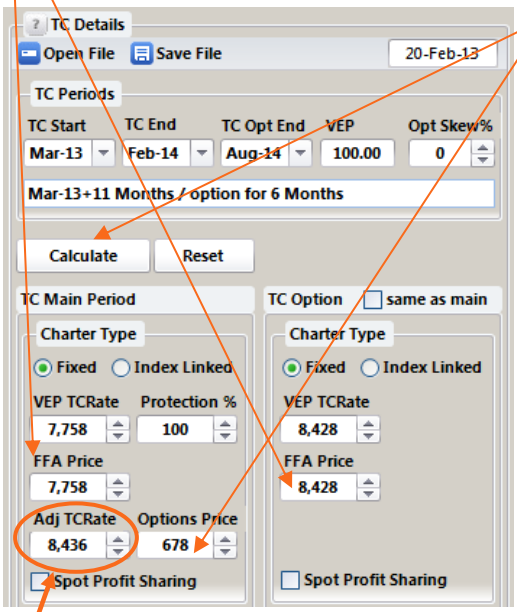
4. The Time Charter (TC) Calculator Form

- The **TC Form** allows you to price a TC proposal in relation to the **intrinsic value of embedded options** within the TC structure. Even a **plain vanilla TC structure**, like chartering the vessel say for four months with option for another two months to the charter, **embeds an option** that affects the end charter rate.
- If you are not aware of the **forward structure of the paper curve** then you cannot accurately assign a strike price to the **call option** the vessel's owner **is extending to the charter**, hence you cannot price in monetary terms ($/day) the effect of the option being sold on the negotiated TC rate.
- The **TC Option Calculator** form can price almost any Time Charter structure with embedded options in a few steps. A **plain vanilla scenario** is very easy to setup, all you need to do is define the main **TC Start month, End Month** and **Option End** period. You do this by clicking on the respective drop boxes in the form and selecting the appropriate values.



- Once you define the appropriate **TC time parameters** a **short description** of the TC time period appears automatically below the drop boxes, and the form fields **[FFA Price]** for the TC main leg and the option period are **automatically calculated and displayed**.

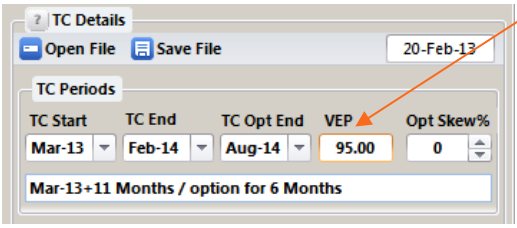
- Notice that the form **has suggested a different paper price for the TC main leg** and **another price for the TC option leg**. This is due to the **structure of the forward paper curve** that currently implies higher rates going forward than presently.



- All you have to do now is to **press the [Calculate] button** on the form for the application to calculate the **intrinsic value** of the **extended call option** and incorporate this value into the main TC rate.
- In the example to the left we have defined a **one year TC** structure with an option to extend it for **another six months**.
- The application has suggested that the **prevailing paper price** for the **main leg** of the TC is around **$7,750/day**, while the applicable **option period paper price** is around **$8,400/day**.
- So the owner should start discussing to **earn at least $7,750** for the main leg of the TC, and set the optional period rate to **at least $8,400/day**.
- After also taking into **consideration the intrinsic value of the extended call option** of around **$680/day** the application has suggested that the main leg TC rate should be adjusted upwards towards **$8,400,** as the **[Adj TCRate]** field of the form suggests.
- **Putting it all together**, the application has suggested that for a one year TC with an option to extend for another six months the owner should **start negotiating a main leg TC rate of $8,400** with an option to extend for another six months at the same rate. These price levels represent **the fair amount** for the owner taking into consideration the intrinsic value of the extended option.

VEP (Vessel Equivalent Performance)

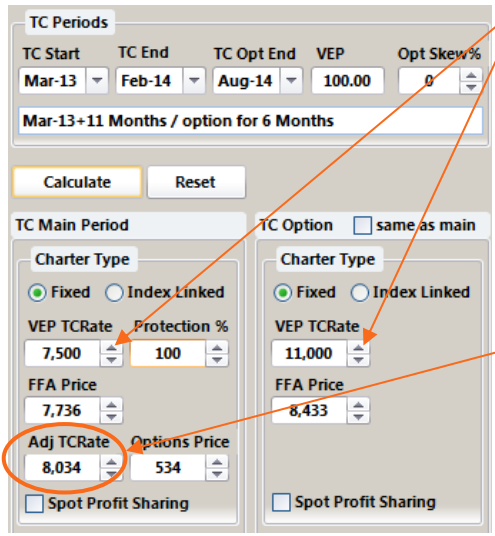
- At this stage we should introduce the **concept of the VEP** field (**Vessel Equivalent Performance Index**). All calculations done so far assume that we are addressing an index type of vessel, for example an LME panamax dry cargo carrier with an age up to five years old.
- However, this is not always the case as **older ships usually fetch less than the market** for a modern vessel, and for this reason we should adjust our calculations appropriately to reflect the earning capacity of our vessel with respect to market levels for a modern ship.



- The **VEP value** representative for our vessel can be set on the top of the form in the respective **[VEP] field**. For this example we have set a value of 95 indicating that our vessel's earning capacity is 95% of the respective LME index vessel**. All subsequent calculations** are **adjusted** to take into consideration our **vessel's VEP index**.

Adding flexibility to TC Rates entered by the user

- So far we have let the **application automatically propose to us** suitable TC levels either for the time charter main leg or the optional leg. What if the user is having in mind a different set of values other than the ones suggested by the application?



- This **is very easy**, just enter into the appropriate **[VEP TCRate]** fields the values you have in mind, and the application will keep these values as a constant and work around to solve for the rest of the parameters.
- In the example to the left, which retains the same TC periods as our previous example**, we have manually entered our own values** for the main leg as $7,500/day and $11,000/day for the option leg.
- Pressing the **Calculate button** once again the application leaves our new entries as they are and proceeds to suggest a **fresh [Adj TCRate]** that should form the basis for our negotiations.
- The application is **flexible enough** to allow us to enter **any pricing scenario** of our choice.

Adjusting the paper curve to accommodate vessel's positioning for prompt laycans

- When you are trying to evaluate a TC Charter with a **prompt laycan period**, say the next one or two weeks, and your vessel is in **a favorable position**, say a panamax vessel in the Atlantic instead of the Pacific, your vessel **will most probably be earning much more** on the first trip out than the average paper prices suggest.

P4TC Swap Periods

PERIOD	IVOL%	HVOL%	RFR%	FPrice
Spot		24.81	0.000	6,845
Feb-13	69.38	34.36	0.030	6,379
Mar-13	66.25	49.42	0.030	8,000
Feb-13+Mar-13	67.82	42.17	0.030	7,291
Apr-13	58.88	34.94	0.070	8,000
Mar-13+Apr-13	62.57	41.15	0.070	8,587
May-13	48.72	27.87	0.070	8,593
Q2-13	49.75	26.44	0.103	8,400
Q3-13	42.50	22.79	0.157	6,850
Q2-13+Q3-13	46.13	24.50	0.157	7,700

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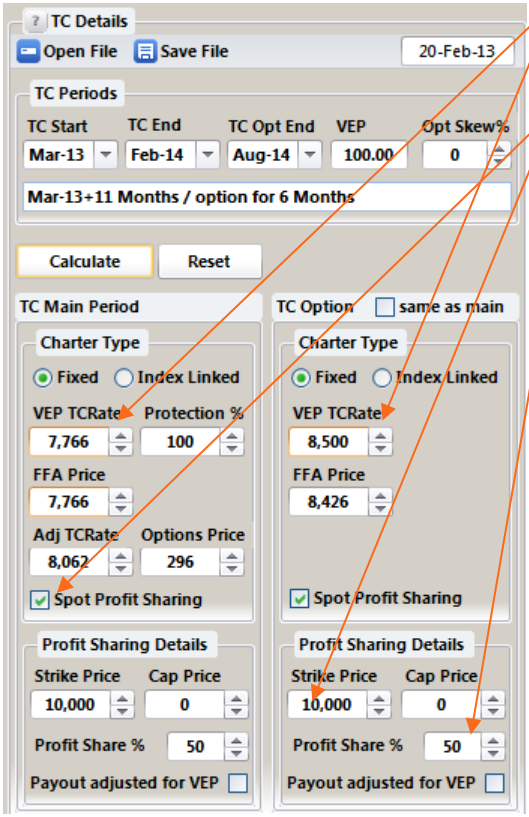
- In this situation you can **very easily adjust the front months** of the **paper curve** as it appears on the left side of the form, as in the example above. Just enter for the first months you estimate the first trip to take place the appropriate values reflecting the favorable positioning of your vessel.
- The application calculator would take these **new values into consideration** when solving for the suggested rates. Was that easy or not?

Pricing more complex TC structures – Profit Participation

- The application allows for pricing **more complex structures** than a plain vanilla TC, like a **profit participation scheme**. In the following example we will assume the same one year period with option for six months, but we will introduce a **50% profit participation** scheme let's say over $10,000/day with respect to the spot index.



- We will leave the main TC leg value to be suggested by the application, and we will input to the option leg a value $8500/day.
- Subsequently we tick the **[Profit Sharing]** boxes on both the main and the option leg and we insert as a strike price for profit participation the value of $10,000/day.
- We leave the suggested value for Profit Participation to 50% as suggested
- Pressing once again the **[Calculation]** button the application will determine an **[Adj TCRate]** value for us that can form the basis for our negotiation.
- In this example the application determined that the fair value for the main leg of this TC structure, taking into consideration all embedded options, is around **$8,050/day.**
- **Putting it all together**, we have just priced a one year TC structure @ $8,050/day with option for additional six months @ $8,500, and a 50% profit participation by the owner over $10,000 respective index level.

- To **better understand the embedded options** involved in this structure, and the inherent complexion of trying to attempt to manually calculate these effects, we will attempt to break down this structure to its **constituent elements** in terms of paper market transactions. The equivalent to this TC structure is therefore the following:

1. Owner sells FFA swap period at the prevailing paper market rate, say @ $7,750, from Mar-13 to Feb-14 to cover employment risk.
2. Owner sells a call option from Mar-14 to Aug-14 with a strike price @ $8,500, this represents the optional six month period extended to the charterer.
3. Owner buys half a call option from Mar-13 to Aug-14 with a strike price @ $10,000 to cover the 50% participation scheme.

- The intrinsic values of all of these actions have to be translated to an adjusted TC rate for the duration of the main charter length. That is exactly what our application is doing, although much faster and more accurately than we could attempt to do this exercise manually, or even trying to use something more sophisticated like an Excel Sheet.

Additional Parameters for the TC Calculator:

- **[Cap Price]:** Although the plain Profit Share structure is easy to set up, there is the possibility to further introduce other parameters, like for instance setting a **Cap Price** to the profit sharing scheme. For example you could define that the owner will receive 50% profit compensation from index levels from 10,000 to 15,000 and nothing above the 15,000 level. For this purpose set the [Cap Price] field to an appropriate level.
- **[Payout Adjusted for VEP]:** most commonly the payout in a profit participation scheme is based on the index itself, with no consideration for the vessel's VEP, so the owner of a vessel will start earning income the moment the index rises over the specified value. There are cases however that the charter imposes that the payout will be based on the VEP adjusted index level. For instance if the VEP for the vessel is 0.90 and the strike price for the profit participation is set at 10,000 then for the owner to receive any money the index itself should rise over the 10,000/0.90=11,111 level. Checking the [Payout adjusted for VEP] box will adjust all calculations to this principle.
- **[Protection %]:** Usually a charter guarantees a floor level for the main leg of the TC structure. This is the absolute minimum the owner will earn. However we have seen recently structures where the owner participates not only on the upside of the index rise, but also with some percentage he is liable for the loss incurred to the charterer when the index falls beyond the TC agreed level. In such a case you just amend the **[Protection %]** field from 100% to the agreed value. The same principle could be applied to a TC with or without a profit participation scheme.
- **[Opt Skew%]:** Synthetic TC structures with embedded options have to be calculated based on certain parameters to value the options, the most important one other than the duration of the option, the current swap price and the strike price, being the so called Implied Volatility of the option.
  In illiquid markets, like the FFA swaps market, the spread between bids and offers could be wide apart, and so is the case in terms of the quoted volatilities in the market. To make the model fairer to both parties involved you can adjust the skew% of the volatility used for calculations to something less favorable than the mid-market level.
  For instance, setting **[Option Skew%]** to a value of 10% will imply that the model in its calculations will increase the volatility level for the purchase of options by 10%, and it will reduce the volatility level for the selling of options by 10% of the mid-value. So if the mid-value is say 60% then a skew of 10% will result in 54%-66% range for sells and buys of options respectively.

  For most purposes you can set this value to zero as recommended by the form.