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Improving Execution Quality

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Executed Quantity Indicator improves volume forecasts by 12%

Having a better forecast of the next day's trading volume can be a distinct advantage for fund managers preparing trade lists and dealers executing in equities markets.

Given the highly volatile nature of trading volumes little analytical effort has previously been devoted to determining a better volume forecast.

Contact the author by email to ensure you receive **free** daily volume forecasts

EQ International's **Executed Quantity Indicator** uses a proprietary method to forecast the next day's trading volume of stocks in equities markets.

Daily volume forecasts are currently available via email for the Australian equities market.

Highlights

For S&P/ASX 200 stocks, EQ International's **Executed Quantity Indicator**:

12% better forecasts...

- improves the predictability of daily volume forecasts by 12% compared with forecasts based on the median daily volume over the past month or quarter

benefits most stocks...

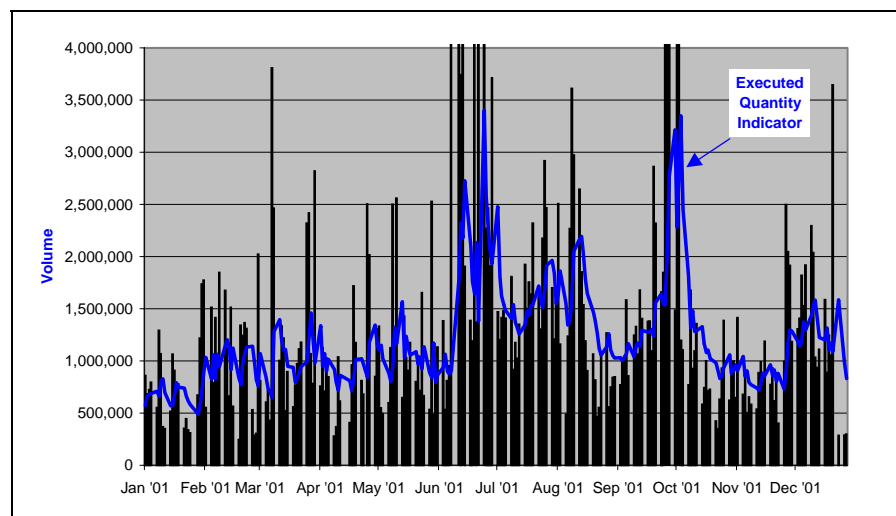
- improves the predictability of forecasts of 198 of the 203 stocks

particularly SGT, TEL, SUN, IAG and NDY...

- significantly improves the predictability of notable stocks such as **Singapore Telecom** (SGT, 21% improvement), **Telecom NZ** (TEL, 18%), **Suncorp-Metway** (SUN, 16%), **Insurance Australia Group**, formerly NRMA Insurance, (IAG, 15%), **Normandy Mining** (NDY, 14%), **ANZ Banking Group** (ANZ, 13%), **Resmed** (RMD, 13%) and **Fairfax** (FXJ, 13%).
- typically forecasts daily volume around 28% different from a 1 month or 3 month median
- highlights when volumes are likely to be significantly above or below typical levels

Executed Quantity Indicator predicts volume with high degree of accuracy

Executed Quantity Indicator predicts daily volume by using all historical data over the most significant historical period



source: EQ International

Volume forecasts generated from historical data

Executed Quantity Indicator is based on historical data over the most significant period

EQ International's Executed Quantity Indicator uses a proprietary method to forecast the next days trading volume of stocks in equities markets.

However, part of its methodology can be disclosed by way of example.

The **Executed Quantity Indicator** is based on volume traded each day over the most significant historical period.

We will use the daily traded volume of Australian stock *Australian Gaslight Company* (AGL) as our prime example.

Daily volume has some special characteristics which makes it more difficult to predict.

Skewed nature of volume decreases forecasting ability

Specifically, daily volume is bound at zero as volume cannot be negative and is skewed in the positive direction via occasional large volume spikes.

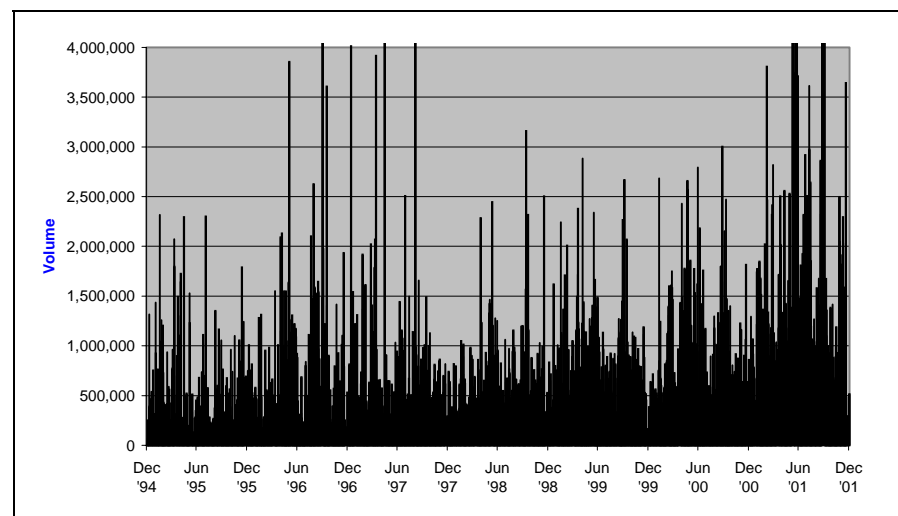
Typically, most stocks

- have some periods of persistently high volume
- have some periods of persistently low volume
- have some periods of seemingly random volume.

EQ International uses each of these volume characteristics to determine its **Executed Quantity Indicator** which is based on volume traded each day over the most significant historical period.

AGL daily volume highlights existence of volume spikes

Volume of AGL was above 4m shares on 15 trading days in 6 years



source: *EQ International*

Examining distribution of volume provides valuable insight

By sorting daily volume in ascending order we can view some other characteristics.

Over the 6 years from 1995 to 2001, the median daily volume of AGL was around 565,000.

This means that on 50% of occasions volume was below 565,000.

On 25% of occasions AGL's daily volume was below 320,000. This is also known as the 25th percentile or lower quartile.

On 75% of occasions AGL's daily volume was below 950,000. Similarly, this is also known as the 75th percentile or upper quartile.

Volume forecasts generated from historical data

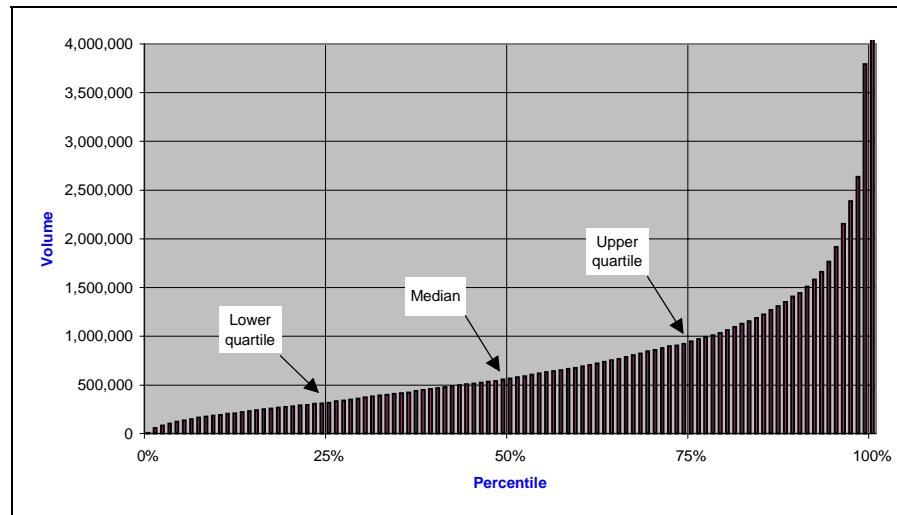
AGL's daily volume shows a typical pattern where the median daily volume is closer to the lower quartile than the upper quartile.

The difference between the median and lower quartile is 245,000, whilst the difference between the median and upper quartile is 385,000.

The ratio of these differences is around 1.5 which is not untypical.

Volume distributions are typically skewed to the right

Median daily volume is closer to lower quartile than upper quartile



source: EQ International

Typical volume estimate is the median daily volume over a fixed trailing period

Many market participants who attempt to estimate volume do so by using a median daily volume over a fixed historical period, typically 1, 3, 6 or 12 months.

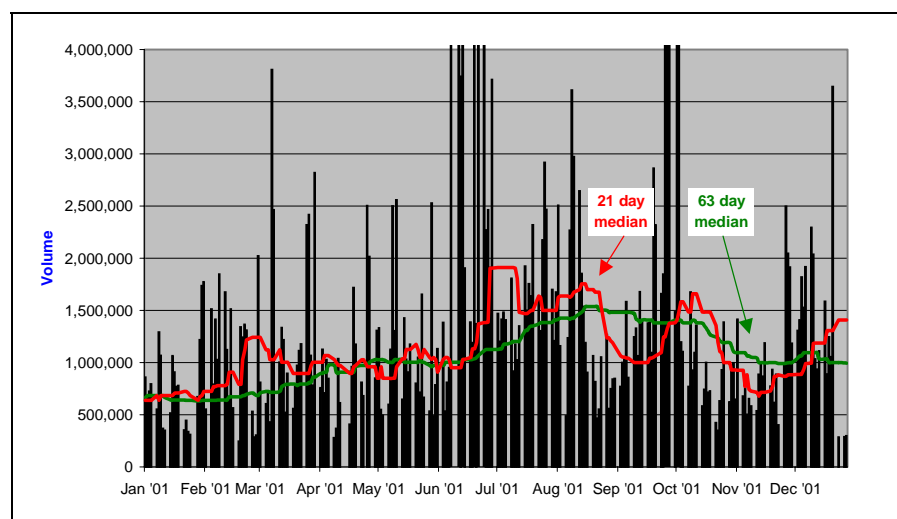
Whilst the 21 day (1 month) median for AGL appears a better estimate of volume than the 63 day (3 month) median, neither appears to be such a good estimate.

Throughout 2001 AGL's volume varies from a low of 200,000 to a high above 4 million. The actual high is 10.5 million.

The 63 day median varies between 600,000 and 1.5 million, whilst the 21 day median varies between 600,000 and 1.9 million.

Median volume over an historical period provides some estimate of daily volume

21 day median appears a better volume estimate for AGL than 63 day median



source: EQ International

Accuracy important in forecasting models

Volume estimates need to be consistent with their usage

As discussed, typical estimates of volume use the median daily volume over a fixed historical period.

Generally daily data is used over historical periods of 1 month, 3 months, 6 or 12 months.

These estimates may be sufficiently reliable depending, as always, on how the estimates will be used.

Benchmark needed for all quant models

Reliability of all models should be assessed.

Quant modelling should always have a pre-determined benchmark for measuring the accuracy of the model.

The benchmark should be carefully constructed to ensure that the most appropriate measure is being used.

Forecasting volume is no different.

We want to find the most appropriate benchmark for determining whether one model is more accurate than another when forecasting daily volume.

Best model has lowest model error

The process we use has several steps, as follows:

1. For each forecast calculate **forecast accuracy**, which is the ratio of actual volume to forecast volume. **Forecast accuracy** is less than 1.00 if actual volume is below forecast volume and above 1.00 if actual volume is above forecast volume.
2. Calculate a measure of dispersion for this derived data. We have chosen the inter-quartile range¹, which is the difference between the 75th percentile and 25th percentile. We refer to this as the **forecast error**.
3. Determine the **model error**, which is the median **forecast error** across all stocks in the sample.
4. The model with the lowest **model error** is the best model. A perfect model would have model error of zero.

Naive model no.1 - Today's volume is the same as yesterday

To monitor model improvement it is always good to commence from a naive starting point.

A naive forecast for today's volume is yesterday's volume. We refer to this as the **yesterday model**.

Our sample is the stocks in the Australian benchmark S&P/ASX 200 index.

We found that **model error** for the naive **yesterday model** is 1.46.

Yesterday's volume most predictable for large caps

Stocks with the lowest **forecast error** based on the naive **yesterday model** are **Telstra** (TLS, 0.65 forecast error), **AMP** (AMP, 0.69), **National Australia Bank** (NAB, 0.70), **BHP Billiton** (BHP, 0.70) and **ANZ Banking Group** (ANZ, 0.71).

Stocks with the highest **forecast error** based on the naive **yesterday model** are **Iress Market Technology** (IRE, 5.4 forecast error), **Lang Corp Prefs** (LACPA, 4.9), **Neverfail** (NEV, 4.1), **Vision Systems** (VSL, 3.4) and **Corporate Express** (CXP, 3.3).

Note 1: For normal distributions, standard deviation is often the most suitable measure of dispersion. As volume is bound at zero and unbounded in the positive direction its distribution will be positively skewed. Hence, the distribution of forecast accuracy will also be positively skewed. Thus standard deviation is not a relevant measure of dispersion in this case. We prefer inter-quartile range.

Accuracy important in forecasting models

Naive model no.2 - Today's volume is the long-term average median

Use median rather than average for any volume estimate

At the other end of naivety is to assume that today's volume is the long-term 'average'.

Although, whilst it is understandable to be naive, rigidly lacking understanding is never tolerable.

Similar to standard deviation being inappropriate for use in non-normal distributions, average is also inappropriate.

So we don't use a long-term average, we use a long-term median.

Our long-term is 2 years of daily data with the model referred to as the *long-term model*.

Long-term model as naive as yesterday model

We found that *model error* for the naive *long-term model* is also 1.46.

Stocks with the lowest *forecast error* based on the naive *long-term model* are **National Australia Bank** (NAB, 0.64 forecast error), **Westpac** (WBC, 0.67), **AMP** (AMP, 0.69), **BHP Billiton** (BHP, 0.71) and **ANZ Banking Group** (ANZ, 0.71).

Stocks with the highest *forecast error* based on the naive *long-term model* are **Solution 6** (SOH, 4.3 forecast error), **Telecom NZ** (TEL, 4.1), **SMS Management** (SMX, 4.0), **Iress Market Technology** (IRE, 3.7) and **Macquarie Goodman Industrial Trust** (MGI, 3.6).

One and three month models are best fixed-period models

We assessed volume estimates based on the median volume over several typical time periods and found that 1 month and 3 month proved most predictive.

One-month model and three-month model are 11% better than naive models

The *model error* for both the *one-month model* and *three-month model* is 1.29.

This is an 11% improvement on the naive *yesterday model* and naive *long-term model*.

The *six-month model* has a *model error* of 1.34, whilst the *one-year model* was higher at 1.39.

Stocks with the lowest *forecast error* based on the *one-month model* are **Telstra** (TLS, 0.62 forecast error), **National Australia Bank** (NAB, 0.62), **BHP Billiton** (BHP, 0.65), **AMP** (AMP, 0.65) and **Westpac** (WBC, 0.66).

Similarly, those with the lowest *forecast error* in the *three-month model* are **Telstra** (TLS, 0.57 forecast error), **National Australia Bank** (NAB, 0.63), **BHP Billiton** (BHP, 0.65), **ANZ Banking Group** (ANZ, 0.66) and **Commonwealth Bank** (CBA, 0.67).

Stocks with the highest *forecast error* based on the *one-month model* are **Iress Market Technology** (IRE, 3.6 forecast error), **Lang Corp Prefs** (LACPA, 3.4), **Neverfail** (NEV, 2.6), **Village Roadshow Prefs** (VRLPA, 2.4) and **Lion Nathan** (LNN, 2.4).

In the *three-month model*, stocks with the highest *forecast error* are **Lang Corp Prefs** (LACPA, 3.2 forecast error), **Iress Market Technology** (IRE, 3.0), **Village Roadshow Prefs** (VRLPA, 2.5), **Neverfail** (NEV, 2.4) and **Goldfields** (GLD, 2.4).

Accuracy important in forecasting models

Executed Quantity Indicator best volume prediction model by 12%

EQ International has improved daily volume prediction by using all available data over the most suitable historical period.

Its volume prediction model continues the theme of *EQ International's* EQI acronym by being known as the **Executed Quantity Indicator**.

As a proprietary model its exact formulation will not be revealed although its results will certainly be highlighted.

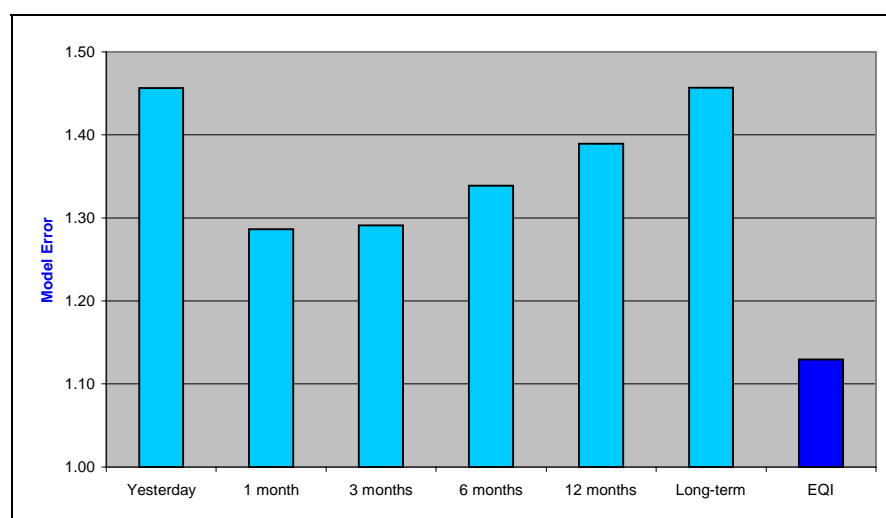
The *model error* for the **Executed Quantity Indicator** is a very low 1.13.

This is a 23% improvement on the naive *yesterday model* and naive *long-term model*.

It is also a 12% improvement on the best fixed-period models, the *one-month model* and the *three-month model*.

Executed Quantity Indicator 23% better than naive models

Executed Quantity Indicator
12% better than next best
model



source: *EQ International*

TLS, BHP, banks are most predictable using Executed Quantity Indicator...

Stocks with the lowest *forecast error* based on the **Executed Quantity Indicator** are **Telstra** (TLS, 0.57 forecast error, 8% improvement on *one-month model*), **BHP Billiton** (BHP, 0.58, 10%), **ANZ Banking Group** (ANZ, 0.58, 13%), **National Australia Bank** (NAB, 0.58, 7%) and **Commonwealth Bank** (CBA, 0.61, 12%).

Stocks with the highest *forecast error* based on the **Executed Quantity Indicator** are **Iress Market Technology** (IRE, 2.9 forecast error, 20% improvement on *one-month model*), **Lang Corp Prefs** (LACPA, 2.7, 18%), **Neverfail** (NEV, 2.4, 7%), **Village Roadshow Prefs** (VRLPA, 2.1, 11%) and **Lion Nathan** (LNN, 2.1, 11%).

with SMX, AXN, REL, AAT, CLH greatest beneficiaries of improved model

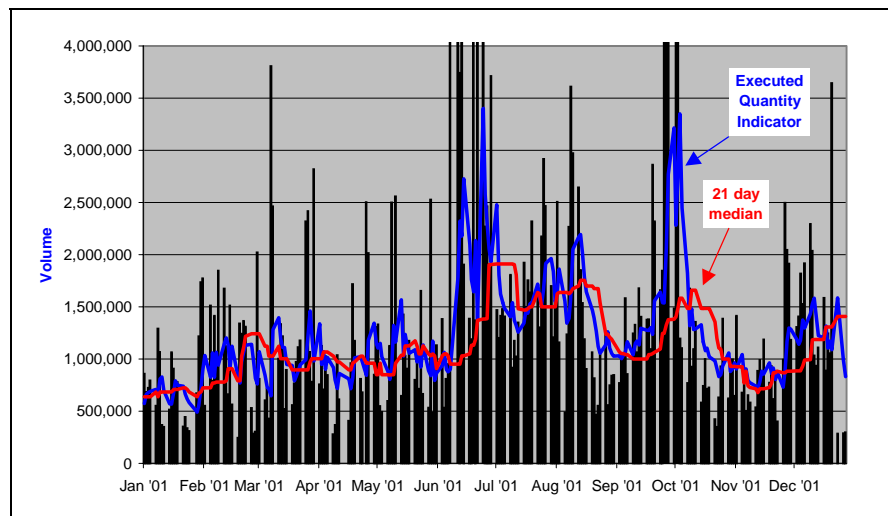
Stocks with the largest improvement in *forecast error* by the **Executed Quantity Indicator** from the *one-month model* are **SMS Management** (SMX, 24% improvement, 1.19 EQI forecast error), **Axon** (AXN, 23%, 0.75), **Renewable Energy** (REL, 22%, 1.34), **Autron** (AAT, 22%, 0.94) and **Collection House** (CLH, 21%, 1.10).

Amongst the leading stocks, those with the largest improvement by the **Executed Quantity Indicator** are **Singapore Telecom** (SGT, 21% improvement, 1.07 forecast error), **Telecom NZ** (TEL, 18%, 1.29), **Suncorp-Metway** (SUN, 16%, 0.83), **Insurance Australia Group**, formerly NRMA Insurance, (IAG, 15%, 0.80) and **Normandy Mining** (NDY, 14%, 0.87).

Executed Quantity Indicator improves forecasts

Executed Quantity Indicator improves volume forecasts for AGL

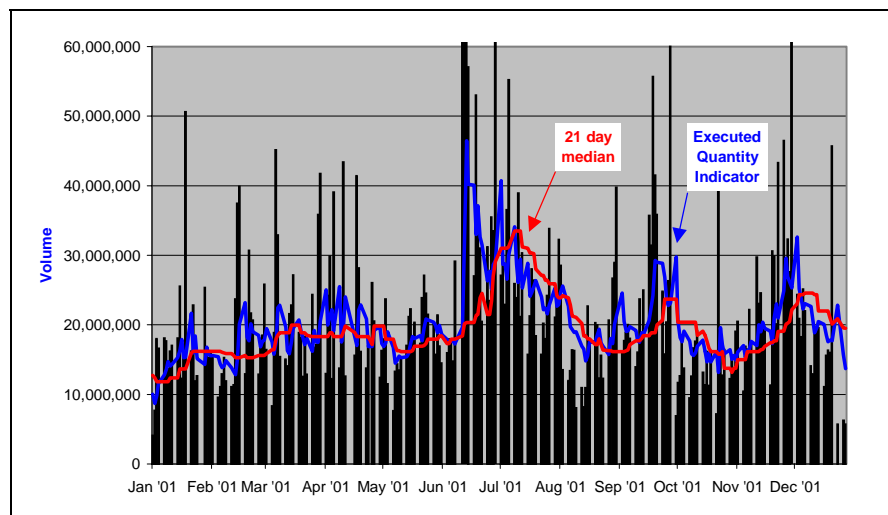
Executed Quantity Indicator varies between 500,000 and 3.5 million, which compares favourably with AGL's actual daily volume range



We present several other interesting stocks....

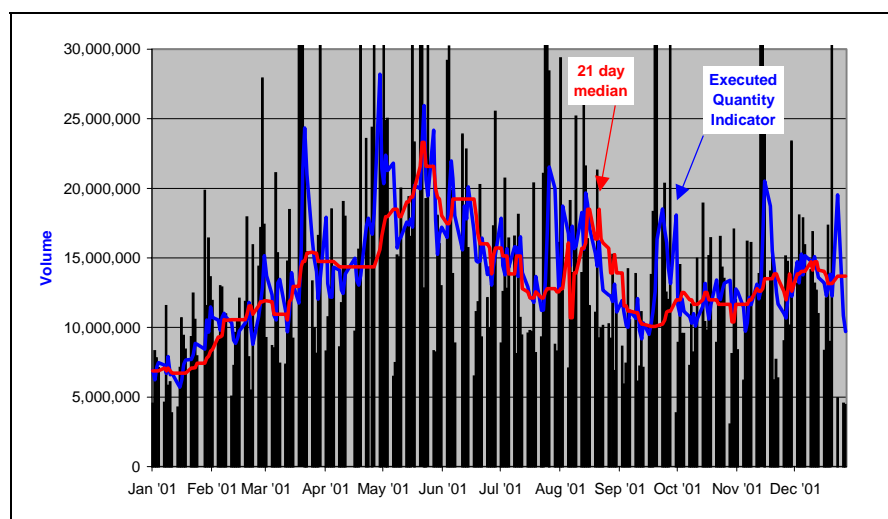
Executed Quantity Indicator improves volume forecasts for TLS

TLS is the stock with the lowest forecast error for the Executed Quantity Indicator and the one-month and three-month models



Executed Quantity Indicator improves volume forecasts for BHP

BHP has second lowest forecast error for the Executed Quantity Indicator and is no.3 for both the one-month and three-month models

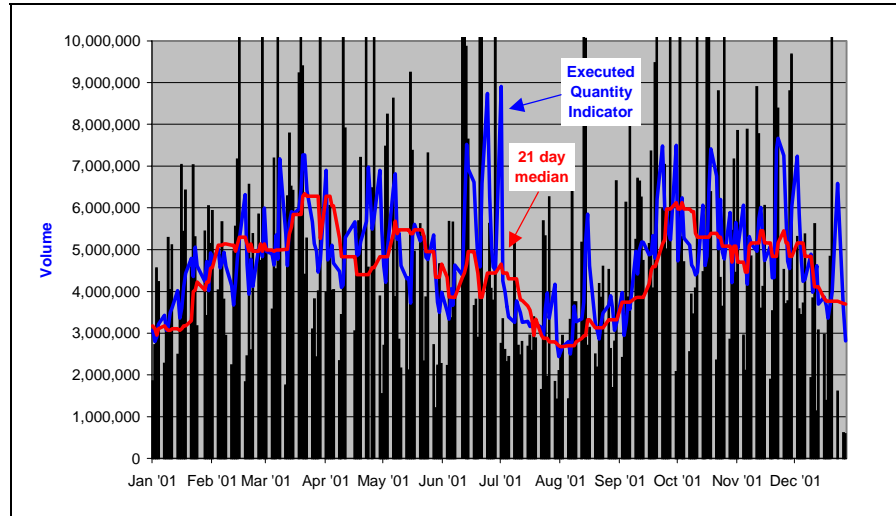


source: EQ International

Executed Quantity Indicator improves forecasts

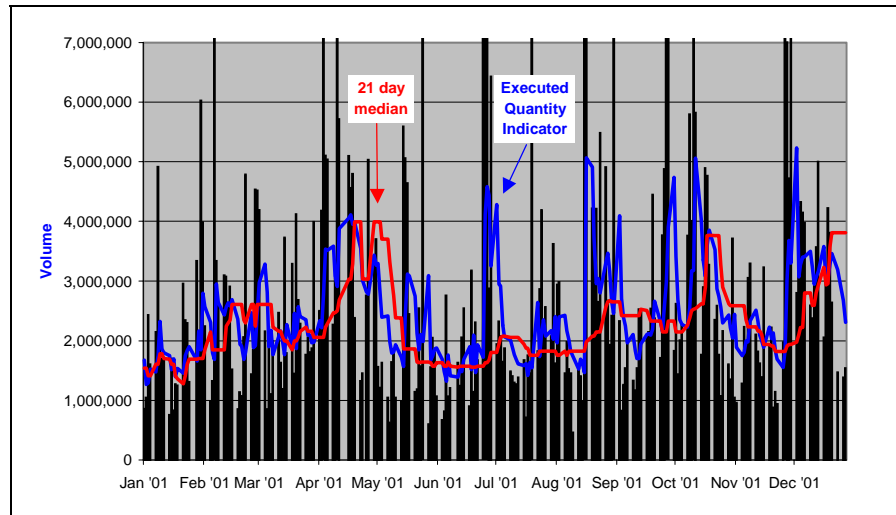
Executed Quantity Indicator improves volume forecasts for WMC

WMC has more volatile volume than TLS and BHP and is more suited by the Executed Quantity Indicator



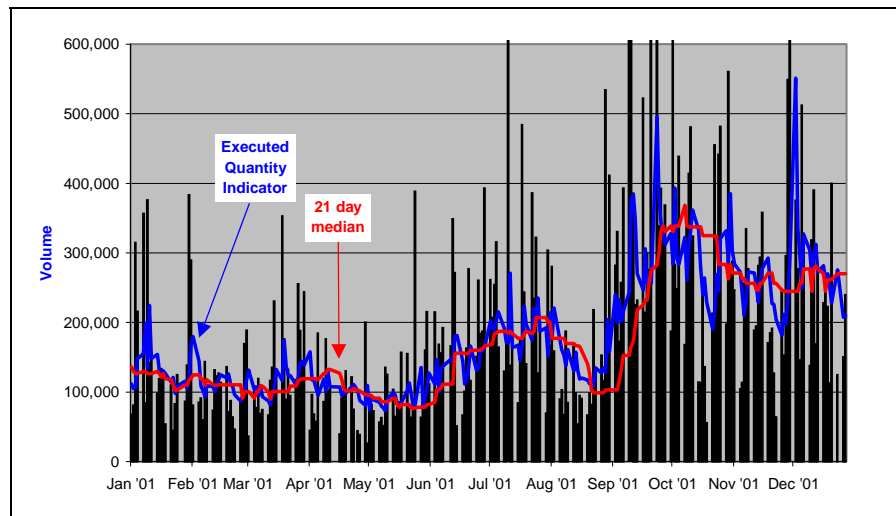
Executed Quantity Indicator improves volume forecasts for CML

The Executed Quantity Indicator is more responsive to CML's regular volume spikes than the one-month model



Executed Quantity Indicator improves volume forecasts for ASX

The Executed Quantity Indicator responds swiftly to ASX's rapid volume changes

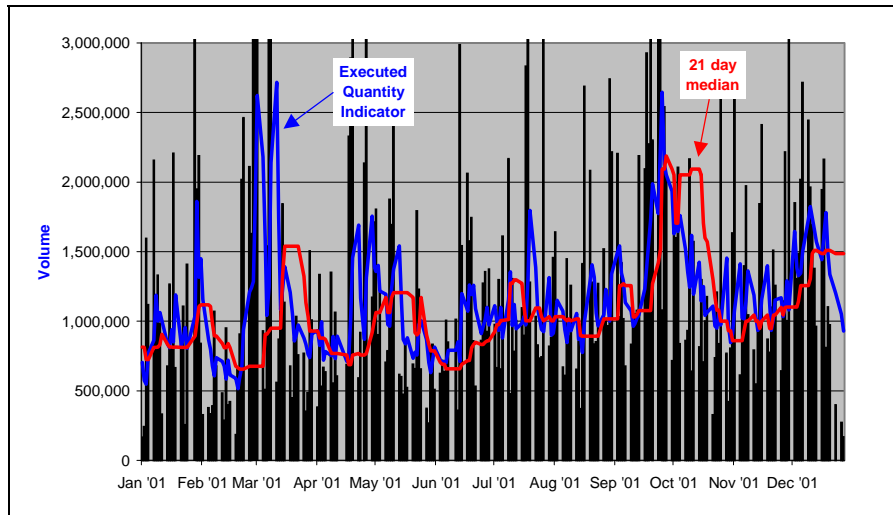


source: EQ International

Executed Quantity Indicator improves forecasts

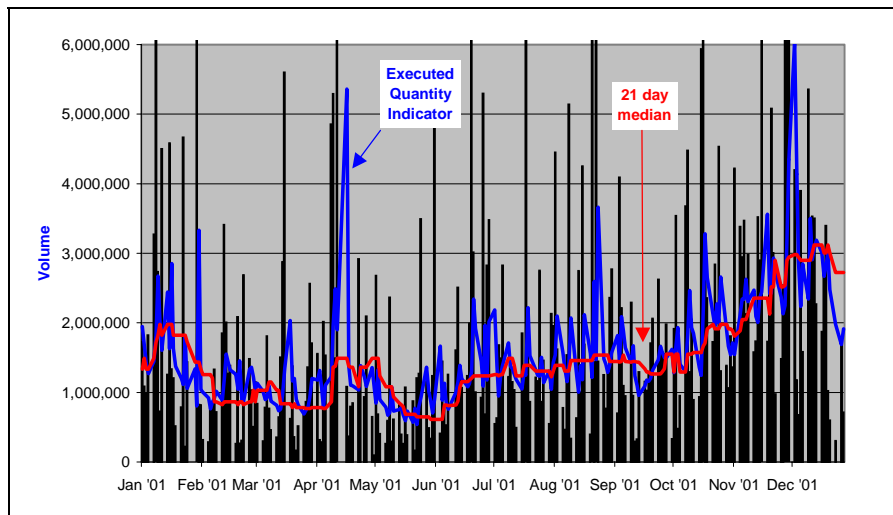
Executed Quantity Indicator improves volume forecasts for TAH

TAH is yet another example of the forecast ability of the Executed Quantity Indicator



Executed Quantity Indicator improves volume forecasts for DOT

The Executed Quantity Indicator improves forecasts for DOT and all the Property Trusts



source: EQ International

Executed Quantity Indicator is currently available as a daily Excel file

EQ International currently provides its **Executed Quantity Indicator** for stocks in the S&P/ASX 300.

This daily service is free for a limited period of time.

Currently, an Excel file is emailed prior to market open. Later the **Executed Quantity Indicator** will be provided to subscribers through Iress.

Please do not hesitate to contact the author by email should you wish to receive this valuable daily service.

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