

FIRST GLOBAL FINANCE
India Research



Valuation Thoughts

What works on Dalal Street

or

(Does anything work, at all, on Dalal Street?)

Back-testing the whole gamut of valuation ratios

+

Bringing the near-term into focus

+

A new way to value commodity stocks

+

How do overvalued stocks behave?

+

*What is the best valuation method?
And how this method can be abused ...*

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Our magnificent obsession

Apart from butter pecan ice-cream, the only thing that gets us excited these days is the art of relating the price of a stock to its intrinsic value. The reason is fairly simple - business's been low!

All right, serious stuff now – the main reason is that all over the emerging world, particularly in Asian markets, investors overpay for growth and returns. It's because of this that having a clear mind (if there is any such thing) on valuation can save us a lot of grief. MTNL is a good example – the stock's been a good story for about three years now – but its price still hasn't crossed its three-year peak even now. This is simply because it's been overvalued quite severely for the better part of this period, so whoever bought it in 1994 and 1995 lost substantial money in real terms. Ditto with SBI. Ditto with a number of other stocks. The other reason is this:

We've heard it over and over again – our markets are more fickle than the average teeny-bopper in a Bombay pub, more irrational than Grasim's decision to put up its plants in the middle of the cement clusters, and as whimsical as our competition's recommendation changes! So why look at valuation?

Well, we, for one, have no intention of turning into rhesus monkeys, and second, we don't believe our markets disregard valuation for extended periods of time.

One usually has two choices in life – swim at the shallow end and play with harmless inflatable ducks - or dive in deep with the Manta rays and Great Whites. Guess what option we took!

At the end of it all, The Best Little Brokerage House In Bombay appears to have hit pay dirt - we've come up with something that will make even the most India-fatigued fund manager feel as though he (or she) has just been through Deepak Chopra's \$ 4000/week New-age soul cleansing rip-off !

And that'll make all this work worth it – the wild hair, sunken – eyes , six-day stubbles (it's an all-male set-up here, barring the head of research) and dark circles (I can tell you, they aren't a pretty sight, these guys!).

Self-interest apart, we recommend that you go through this report from cover-to-cover, since it does dispel a few commonly-held notions, as well as make a genuine attempt at testing market efficiency in India.

And if after going through this piece, you think we have delivered, would you let us know?

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“I have a rule in my business: to see what can happen in the next ten years, look at what has happened in the last ten years.”

Andy Grove



I. The Quick and Dirty Guide

Congratulations, ladies and gentlemen. You are one of the privileged few to get your hands on the most definitive and seminal piece on stock valuation in India.

The methodology we followed can be found in Chapter VIII. Here, we present The Quick and Dirty Guide to the report...

We back-tested a large number valuation ratios/measures to see which ones best predicted stock returns. The period used was from Dec. 6, '91 to Apr. 10, '97. The beginning period was decided by choosing a period of relatively low volatility – what lay just after that is part of capital market history.

The dependant variable was compound annual stock returns over a five year period. This variable was tested against the following independant variables – singly and in combination :

Let's start in an ascending order of significance:

The variables with the least correlation with Five-year stock returns

□ *The study demolishes quite a few myths*

Returns vs P/E Ratio

This regression's R^2 was 6.85%. Not surprising. The P/E ratio is perhaps the most illogical and unscientific valuation tool around. With growth, returns, risk and cost of capital differing from country-to-country, sector-to-sector and stock-to-stock, how on earth can we standardise across through a single ratio? The results bore out our assertion even without cross-country complications.

Returns vs Price/Book Value

Same as P/E. $R^2 = 4.3\%$. Not surprising again, and tells you that our market looks at something beyond this to decide valuation.

Returns vs Price/Cash EPS

The worst of the lot. R^2 only 1.2%. The P/CEPS ratio too, is a highly illogical one. *The level of depreciation that a company needs relates to the nature of its business. Unless one is sure that it is over-providing for depreciation in some way, it is wholly incorrect to say that PAT and depreciation equals cash flow. In the long-run, this cash flow (Depreciation) will have to be spent on capex or else, the company runs the risk of going out of business. This tool is of some use only for intra-industry comparisons – and then too, with a number of caveats.*



The somewhat better ones

Returns vs Lynch Ratio (P/E / CAGR of EPS)

The Lynch ratio, conceptually, appears to be flawed. The attempt is to find a stock that has a low P/E relative to its growth rate. Let's think about this – what kind of company would exhibit this characteristic? *The logical answer is – a company that increases earnings growth through increases in capital employed – and unless it is intelligent enough to keep OPM, leverage and asset turnover up (when Capital Employed increases sharply, there is every chance that, at least, asset turnover will decline) – Return on its Capital Employed declines in tandem. History is replete with examples of companies of this kind – HDFC, Reliance, Ranbaxy, L&T. All these and lots of others have seen earnings growth come at shrinking multiples, because the market penalises them for dilution of return ratios. And the Lynch ratio leads you precisely to such companies – companies that grow earnings at the cost of returns, and therefore, (deserve to) trade at lower multiples.*

These are the very companies that you want to avoid!

That's not to say it has no significance – R^2 is 38%. (This is the R^2 of returns vs 1/Lynch Ratio, as the Lynch ratio, by itself, did not deliver much – R^2 was only 26%) OK, but not conclusive enough.

Returns vs RoE

This is one theory in circulation – “The company that keeps beating its cost of equity by a wide margin (or adds economic value) on a consistent basis earns healthy stock returns on a consistent basis.” How true is this? *The Indian stock market is much more efficient than it is made out to be. Companies with high RoEs often have it all in their price, resulting in high P/B ratios - and very often much more than what they deserve. It does not necessarily follow that high RoE companies will give high stock returns.* The important point here is to relate fundamentals to price, and once the price has it all, supernormal profits can become a pipe-dream. Hence, valuation becomes a crucial factor in such cases.

Our sample of companies have shown a fit with an R^2 of 25.5% - not as low as P/E or P/BV but not high enough to support the theory.

Return vs EPS growth

The draw back in EPS growth is the same as the drawback in Lynch ratio. A company can have a healthy EPS growth even if the fundamentals indicate otherwise. Surprised? This is how: the company can increase its leverage (and hence earnings growth) simultaneously increasing the risk inherent in earnings growth which would not be captured in the ratio. Also, a company can show high earnings growth by issuing shares at steep premiums (despite a fall in RoE) which is obviously not reflected in the ratio. HDFC is the best example of this – the company issued shares at a steep premium and showed handsome earnings growth despite declining trend in RoE.

The R^2 for this ratio is 22%, which again dispels the notion that stock returns are driven by earnings growth or that buying a growth stock, per se, is a good idea.



Returns vs EV/Gr. Adj. EBIDTA

The R² for this ratio is 10.2%. The R² for Gr. Adj. EV/EBIDTA is lower than that for Gr. Adj. P/E which is 22%. Does this mean that the market attaches more value to net profits than to EBIDTA?

The reason behind this skewness will be obvious from the following facts- the OPM for the sample improved from 17.7% to 21% from FY92 to FY96. However, NPM nearly doubled from 6% to 11.6% during the same period.

The reasons behind the improvement in NPM were a reduction of the debt equity ratio from 1.2:1 to 0.5:1 combined with a reduction of the effective tax rate from 35% to 28% for our sample in the corresponding period. The more impressive statistic was that, unlike in most cases of deleveraging, this improvement in NPM was combined with an increase in RoE – from 17% in FY93 to 22.5% in FY96.

Conclusion : the market gives credit for improvements in Net Profit Margins even if these do not come from improvement in Operating Profit Margins if it perceives the improvement in NPM to be a result of secular changes, which, in this case was true. The use of EV/EBIDTA to value stocks anyway suffers from the constraint that the effect of leverage is not segregated.

Returns vs 4-yr. Discounted Operating Cash Stream (DOCS)/MP

After the degree of undervaluation, the next best fit is obtained from the 4-yr. DOCS/MP (a measure of operating cash flows accruing to equity shareholders over the next 4 years) (See Pages 5 and 19 for detailed definition) to market price. Here the dispersion from the line of fit is more than that for the degree of undervaluation. As it can be seen from the graph there are three outliers, Madras Cements with a high percentage of operating cash flow coming in the 4 year period (FY93-FY96) and Thomas Cook and BSES having a negative cash flows from operations. For the purpose of our analysis, we have excluded these companies.

The R² for this valuation tool is 40.8%.

Returns vs Growth Adjusted Earnings/Price

This valuation tool has a R² of 27% which is not as high as degree of undervaluation on DCF basis but is better than more conventional tools. This tool is very useful for commodity companies. If one has to value commodities on straight P/Es then one can get caught at the wrong end of the cycle. Hence, growth adjusted EPS which captures the weighted average EPS for the entire cycle becomes a very useful tool, when looked at relative to price.

Also, growth companies which prima-facie look overvalued on simple P/E basis would give a realistic picture if valued by Gr. Adj. P/E.



And now, the clear winner

Returns vs Degree of Undervaluation on a DCF basis

“After all, India is a sentiment driven market” – this comment is repeated often enough in the suit - tie segment of the financial markets. The often unsaid sub-text being – “What else do you expect with the market being in the hands of the likes of Kantibhais and Ghanshyams?” But the home-grown businessman or investor is nothing if not savvy, and he can certainly do math. Nothing proves it better than our analysis of the drivers of market returns.

Degree of undervaluation (transformed) (based on the DCF analysis) has emerged as by far the best possible valuation tool with a R^2 of 62%. Over the medium-term, companies which were overvalued have given sub-optimal returns and the ones that were undervalued have given superior returns (see table below). The DCF technique takes into account factors such as returns, growth and risk quantitatively, and therefore makes eminent logical, intuitive and financial sense. Let's take a look at the findings.

Returns achieved by stocks that were undervalued or overvalued on the DCF technique

Degree of Undervaluation (transformed) (DOU) on DCF Value basis	Average Returns (%)	Number of Companies
DCF Value > 200% of market price	42	17
DCF Value = 200% to 150% of market price	36	7
DCF Value = 150% to 120% of market price	25	4
DCF Value = 120% to 80% of market price	17	10
DCF Value = 80% to 50% of market price	9	8
DCF Value < 50% of market price	3	8
Sample Average Returns	21.5	Total 54

To refine our analysis further, we tried combinations of DOU and some of the other variables which had shown a reasonable degree of correlation with returns. The final regression equation use the following four independent variables: DOU (transformed), 4-yr. DOCS/MP, Growth Adj. E/P and RoE (See Chapter IX for details).



II. Bringing the near-term into focus

A psychological block to using the DCF technique to value stocks is the fact that a large part of the fair value of a stock comes from the terminal value – which rests five, ten or fifteen years out. Well, that is an inescapable fact – and whether or not we have an implicit terminal value in mind, the market always does.

However, it is perfectly rational to make an attempt at bringing the near term in focus. But that's the tricky bit. We toyed with a whole lot of approaches, tested several near-term valuation techniques. In the end, we hit upon a ratio that is positively astounding in its intuitive simplicity :

The inherent logic of the market is that it attaches greater value to companies that generate free cash, because cash is what ultimately helps pay the bills! We've tested this and found that a reasonably high correlation ($R^2 = 62\%$) exists between returns and long term undervaluation (transformed) on a cash flow basis. If this is true in the long-term, then it should be true in the medium-term as well (about the short-term, you could be as dead as you would be in the long-term, so let's not focus on next week's price movements). We tested it statistically and got an R^2 of 41%.

Leading on from this, we reckoned – a 4-5 year cash flow forecast should be a reasonable way to go. So we defined it thus :

	Net Operating Profit Less Adjusted Taxes (NOPLAT)
Less :	Working Capital Changes
=	Operating Cash Flow (OPCF)

This OPCF is calculated for each of the four or five years and discounted back to the present day at the WACC (Weighted Average Cost of Capital) and liquid assets added to give the DOCS (Discounted Optg. Cash Stream). This value is then compared with the firm value calculated on a DCF basis. This ratio indicates what the operating cash flows, in say, the next 4 years available to equity holders contribute to the total equity 'fair value'. This ratio can then be converted into the proportion of Market Price that accrues to equity holders as operating cash flows during the next 4 years. An example makes this clearer.

Rs. mn	Yr.	1	2	3	4
	OPCF	100	120	140	175
	WACC	15%			
	4-year DOCS	425.3 + Non Optg. Assets (Rs. 4.7 mn) = 430			
Total firm value on DCF Basis		700			
Split as : Debt		200			
Equity Fair Value		500			
Market Capitalisation of equity		650			
4-year DOCS attributed to equity holders		= 430 X $\frac{500}{700}$ = 307			
4-year DOCS to Market Cap.		= $\frac{307}{650}$ = 47.2%			



We stop at the operating cash stage (and not go on to deduct capital expenditure and add depreciation) because of the perfectly reasonable assumption that over the medium-to-long term, depreciation will equal normal capex, so, the net effect of the two will be zero.

Further, even though a company has strong Operating Cash Flow, the same at the net level may be negligible or even negative, if the company is in the midst of substantial capex (Madras Cement is a great example: 5-year DOCS/Market Price is currently about 70% – very high – but at the net level, it is negative, because of capex). However, the market may not penalise a company (this was one hypothesis which was borne out by results as the discounted value of free cash flows in 4-5 years had a far lower correlation with returns than the 4 year DOCS), as long as it believes that the capex is reasonable and justified, and the company will earn at least its cost of capital on the incremental capital employed.

This calculation adds clarity to DCF analysis as it allows the investor to combine both the short/medium term and the long term, and makes for a clearer decision-making process. View this :

	Company A	Company B
DCF Fair Value (per share)	Rs. 100	Rs. 100
Market Cap.	Rs. 666 mn	Rs. 2000 mn
Market Price (per share)	Rs. 50	Rs. 34
% Undervalued (FV-MP/FV)	50%	66%
4-year DOCS available to equity holders	Rs. 300 mn	Rs. 400 mn
As % of Market Cap.	45%	20%

One can see that even though Company A is less undervalued than Company B on a long-term basis, a larger part of its value comes from the next five years (part of the explicit period). This makes the company's value more visible than that for Company B – and if you are looking for risk minimisation, then Company A is the one you should pick, even though it is not as cheap as company B. But let's not stop here – one can carry this analysis further, to the realms of commodity stock valuation or stocks where the view beyond 3-5 years is hazy, like in the case of VSNL. This, in the next chapter.



III. Valuing Commodity stocks, ... and some others

A common problem in valuing commodity stocks is that getting the two ends of the cycle correctly is difficult. And if one stops in the middle of a cycle, the value derived can be totally misleading. But the previous chapter gives us a clue as to how to go about getting the near-term into the equation as well.

The visibility of earnings become especially important in a commodity stock or a company with an uncertain long-term future (eg VSNL). For instance, if you were looking a Hindalco or a Reliance at a point in time when the aluminium or petrochemical cycle was supposed to trend up and you could see that 60 or 70% of the price you were paying for the stock will accrue to you over the next 3-4 years as cashflows, your view on the stock may well be more positive than it would be if the price uptrend was an uncertain number of years out into the future. Similarly, in the case of VSNL if you were to get back most of your investment before its monopoly ends in 2004, you may not worry too much about the terminal value.

Let's work with live examples :

Back in December 1996, Hindalco's fair value came to around Rs. 650 or so (without factoring in the new greenfield project) – with the market price being there as well, the stock was fairly valued. But the near-term (next five years) was painting a fairly exciting picture. Even assuming fairly conservative realisations over the next five years (1997-2002); about 45-50% of the company's fair value was accruing to the stockholder in the next five years - the infinite period beyond that would bring the rest. What this meant was that the margin of safety was substantial. As an investor, you were capturing a significant part of the company's value in a finite time span. And if, in a sensitivity analysis, you worked with only slightly more aggressive numbers on realisations, you could see that a figure as high as 80% of the fair value would flow to you over the next five years. That's margin of safety for you.

Reliance is another great example. In December 1996, the fair value was about Rs. 300-310. The price was Rs. 200-210. So there was adequate margin of safety. But even better – nearly 90% of the market price of the company (your investment) would have flowed back to you in the next five years by way of operating cash flow. Think of it as a discounted pay-back period. If you are able to get a significant portion of a company's fair value in the foreseeable future itself, (and better still, the stock trades at a reasonable discount to its fair value), then your margin of safety is huge. Hard to lose money this way.

VSNL is a special case, but can be looked at similarly. Fair value is about Rs. 750 or so - but Discounted Operating Cash Stream (DOCS) over the next five years, discounted at the WACC, amounts to about 35% of its current price of Rs. 1200. This is because VSNL is a tremendous cash generator – but the problem with it, is its unnecessarily aggressive capex program. That's turning this strong Operating Cash Flow negative at the next level. But if it were to come down to Rs. 700 or so – then you would have margin of safety, since the next five years' DOCS would deliver about 80% of the stock price, which is your investment.

You will find details of this measure in all our research from now on.



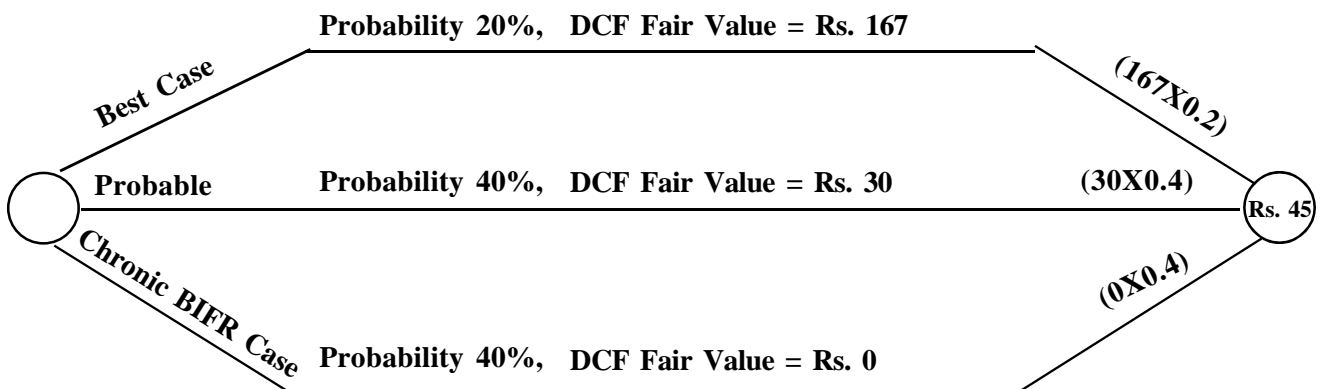
IV. Apparent mispricing maybe a result of perfect hindsight

Going back to Dec. '91, we find that a good 80 % of the stocks were trading at prices such that the fair value fell beyond the $\pm 20\%$ range of prices. From this statistic, it appears that the market was mispricing a significant proportion of the stocks. However, this impression could be way off the mark due to a simple reason – we are using historical financials for the period FY92-96 as forecast numbers to calculate the fair value. However, were you actually sitting down to do the DCF analysis in Dec.'91, you would not have had the benefit of 20-20 hindsight and therefore, the assumptions could well have been different. There have been some (or rather a lot of) changes in the interim which logically could not have been anticipated in 1991. To give only one example, the corporate tax rate has come down from 51% to a soon to be 35% which naturally would not have been foreseen. The liberalisation process has changed the growth trajectory of several industries both for the positive (eg the hotel industry) and the negative (eg commodities, where import tariffs have declined).

Sitting in 1991, would you have projected a \$/Re exchange rate of Rs. 35 and therefore found East India or Indian Hotels to be undervalued? In fact, even if you'd projected the exchange rate correctly, you may have well have combined it with a much more pessimistic view on inbound foreign travel – not very illogical considering the magnitude of the macro-economic crisis that India was facing in 1991.

Then there are unforeseen regulatory changes – the easing of restrictions on foreign currency allowances for outbound travellers meant Thomas Cook's growth zoomed. A similar effect was noticed for Castrol when controls on volume sales were effectively dismantled with freeing of lube oil imports and rationalization of base oil tariffs.

There is another category of stocks that appears hugely undervalued in 1991 with the benefit of hindsight – the turnarounds like TVS Suzuki and Carrier or new companies like Infosys. This is simply because turnarounds are awfully hard to predict correctly, as when the company is down-and-out, there may be several possible outcomes of the future of the company. For instance, if you were studying TVS Suzuki in 1991, you would actually be sitting at an uncertainty node of a decision tree with, let us say, three possible outcomes :



The expected value of the 'fair value' is about Rs. 45 ($167 \times 20\% + 30 \times 40\% + 0 \times 40\%$) which would be the Expected Monetary Value of your investment. But as a risk averse investor, you may have wanted a greater margin of safety in a stock like this where there was a 40% chance of having to write off your investment, so you may not have been willing to cough up the EMV. Or put another way, you'd have used a higher discount rate and therefore arrived at lower fair values under each outcome. Of course, since TVS Suzuki operates in the auto sector which was generally undervalued in 1991-92, it may still have been undervalued but not by as much as it appears by comparing the Rs. 167 'fair value' with the market price of Rs. 28. In fact, talking about the auto sector brings us to the next chapter.



V. Short-term factors do influence the DCF analysis & therefore fair value

This is because the DCF analysis is a dynamic analysis which is based on your (or the market's) best guess for the future. Any short term factor whose impact is confined to a limited period has very little impact on the 'fair value'. For example, a minor fire in a plant which disrupts production for 3 months, does not impact the 'fair value' much unless it is seen as an indicator of possible persistent problems in a company/industry. ***Where short term changes become significant is when they are an indication of a change in the underlying business dynamics of the company.*** For example, the CAGR for Hindustan Lever for the period 1985-90 were – revenues 14%, EBIDTA 12%, PAT 13%. Now if you were sitting in 1991, these are the figures you would be extrapolating from. In fact, keeping to the same growth trajectory and even building in a substantial improvement in the return ratios, you'd have ended up with a fair value of Rs. 162, pretty much in the same range as then market price of Rs. 175. However, when the company showed a 25% growth in revenues in 1991 (even though OPM did not keep pace) on top of 2 previous fairly good years, the market (correctly) surmised that its plane of growth was changing and upped its valuation. Thus, though with our 'fair value' calculation, the stock appears hugely undervalued in 1991 it was probably reasonably correctly valued given the information available then.

The caveat in extrapolating short term growth rates over the long-term is the ability to segregate secular and cyclical changes. This is, however, easier said than done. The market itself does not always get that right.

Coming back to the auto industry – the market seemed to have taken an overly pessimistic view of the industry in 1991 because it was in the middle of a recession. Almost across the board, the auto stocks were undervalued. The only apparent exception is Telco where a distortion has now been introduced in the form of the car project which will lower returns – however, this again, is new information being super-imposed on the past. On the CV business stand-alone, Telco would've also been undervalued in 1991. Even on the upside, extrapolating cyclical trends can be hazardous as was seen recently on the Air Conditioner market where a volume growth of around 40% was a cyclical peak or a one-time occurrence representing release of pent-up demand, but was used to (incorrectly) upgrade the industry growth trajectory.



VI. How do overvalued stocks behave?

One phenomenon that comes through loud and clear is that most stocks that were overvalued back in 1991 returned far less than the undervalued set. But only the companies that sprang nasty surprises on investors have been losers on an absolute scale (See table on Page 4). So what does this mean? You might say – even the overvalued ones did return something and as long as they generate positive returns, why should anybody complain?

You have a point. But think about this – if the overvalued set returns even only a few percent points less than the undervalued set, the differential at the end of a reasonable period – say, five years – can be enormous, because of the effect of compounding. Witness this :

Scenario I : Rs. 100 invested at 10% return CAGR for 5 years.

Value at the end of 5 years : Rs. 161

Scenario II : Rs. 100 invested at 15% CAGR for 5 years.

Value at the end of 5 years : Rs. 201

As is clear, such under-optimisation of returns (a difference of about 25% total), even if they are positive returns, can result in extreme stress! And in any case, our sample consists only of the ‘survivors’ and by definition, the ‘no hoppers’ like Voltas and Bombay Dyeing who have had seriously underperformed are not even part of our sample.

Even then the difference in returns has been substantial. As a group, stocks where fair value was 20 - 50% higher than their market price have returned 25% pa whereas companies with the same degree of overvaluation have returned only 9% pa. What this means is that Rs. 1000 invested in the first group would have turned into Rs. 3052 over 5 years whereas the same money invested in the latter group would be worth a measly Rs. 1539.



VII. The abuse of the DCF method

By now, this report is in the hot, little hands of our competitors – and from tomorrow, you'll start getting everybody's research with a DCF valuation page because that's the mandatory page to fill !

Well, since we care about you guys a lot, allow us to warn you – the DCF method is open to more abuse than the Value-based Advance Licensing system here! Particularly where the terminal value is concerned. Since this bit typically delivers about 50-90% of the total value of a company, you could find assumptions of growth and returns in the terminal period becoming more aggressive than the average driver on the roads of Delhi! Alternatively the value-drivers will be hidden behind an opaque terminal P/E or EV/EBIDTA multiple. And this will severely inflate the value (inflate because most of us are “buy, buy, buy” more often than the other way around) of a stock even more than the inflation in salary levels when one switches to a foreign house from a local one!

That's where we come in – we sit peacefully, attempt to get to the alpha level, and then vigorously run over all the terminal assumptions. Having lived through the recessions of 1987 and '91-'92, we are inherently conservative – so you won't find us using long-term growth rates that would put to shame the 1997 growth in BHEL's profits! So, if it's long-term, carefully debated valuation that you are after... think of us.



VIII. Methodology

● Objective of the Study

Simply put, what we set out to do was rather ambitious – a back-test of all possible valuation methods to check what worked and what didn't in the market, and therefore what could be used to predict returns.

Thus, by definition, our dependent variable was stock returns. Independent variables tried out consisted of virtually any valuation tool we could think of, right from the conventional P/E and P/B to the DCF based 'fair value' to RoE and growth (for those who believe in buying high growth and/or high return companies at any price).

● Sample Choice

Like for all statistical studies, we had desired to have a random sample of companies for our analysis. But, unfortunately in India, the universe of the actively traded stocks is just around 3% of the listed companies. A random sample would have had too many illiquid stocks which would skew results. Also, most institutional investors are interested only in large, liquid stocks and the behaviour of these may have been different from that of a general sample.

Therefore, we decided to define a sample which would closely approximate a large part of the current investible universe. This, by definition, meant that the sample was biased – it consisted of the winners, or at least the survivors, of the last few years.

The ones that didn't make it (like a large section of the old Sensex) have not been included (which is why our sample gave compounded returns of over 21.5% against 14% for the Sensex for the period studied). However, we think the bias is not so important, as our effort was not so much to extrapolate from a small sample to a large universe as studying a large portion of the relevant universe. We chose a sample which represented around 50% of the market capitalisation of the Bombay Stock Exchange.

The initial sample (which, in statistical terms can not be called as random sample) covered around 72 companies having a market cap of Rs. 2,500 bn (\$70 bn).

This list was pruned to eliminate the companies which did not have a sufficient stock market history and earnings records. The companies with insufficient stock market history included most of the finance companies such as Oriental Bank of Commerce, HDFC Bank, IDBI, SBI, LIC HF, Bank of Baroda as well as some others such as Marico, NIIT, Infosys, Thermax. And also, the companies with skewed earnings/cashflow records such as Tisco, and other loss making (turnaround) companies such as Carrier Aircon, P&G, Indian Shaving Products. The loss making (turnaround) companies give very skewed growth figures which were inconsistent with our analysis.

Of these, the possibly controversial exclusions from the sample are those of SBI and Tisco, since these are large, liquid stocks with a huge weightages in the Sensex. But in each of these companies we faced an insurmountable problem. SBI's scrip started trading actively only after its public issue around 3 yrs



ago, hence, the rather artificial base price (due to thin trading prior to the public issue) distorted the return figures. Tisco has, as we all know, spent huge amounts on capex in the last five years for modernisation and upgradation of its facilities. This, along with its proposed capex, has left the company with immense negative cash flows which distorts the study to a certain extent. ***In fact, had Tisco not been able to access huge amounts of outside funds during the last few years, the DCF value of the stock would've been negative!*** Hence, we have excluded these companies from our sample.

The revised sample has 54 companies covering various industries (for the list of companies see Annexures II). The companies covered have a market cap of Rs. 1950 bn (\$ 55 bn). A closer look at the sample reveals that the sample covers most of the actively traded, large stocks. Hence, the sample could be taken as a proxy for the market as whole.

In a couple of ratios such as Lynch and Discounted Optg. Cash Stream (DOCS)/MP (for definition see Page 19), we have excluded a few companies. The theory of Lynch ratio is, that lower the ratio the more attractive is the stock. But, in the case of ACC and SKF Bearings the EPS growth has been negative, hence, Lynch ratio turns negative. This is where Lynch ratio fails, hence we have excluded SKF Bearings and ACC in the calculation of R^2 of returns with Lynch ratio, reducing sample size to 52.

As far as DOCS is concerned, we have excluded finance companies for calculating R^2 for Returns vs 4-yr. DOCS/Market Price as these companies had been valued using the equity approach rather than the firm value approach. Also, for companies such as Thomas Cook and BSES the 4-yr. DOCS was negative and for Madras Cements the DOCS/MP went beyond 100% which distorted the best fit, hence we have excluded the same from the analysis of DOCS/MP.

● ***Inclusion of PSUs***

PSUs such as Nalco, BHEL, MTNL, VSNL, BPCL and HPCL which were listed after the base period have also been included. Since these PSUs contribute a large part of the current market capitalisation on the BSE, their exclusion would have rendered the study incomplete. Some adjustments were, however, necessary to make the data for these companies usable.

The stock prices for calculating various ratios have been adjusted backwards taking the average sample returns as a discounting factor to estimate the stock prices for the base period. The implicit assumption is that, had they been listed, these stocks would've given sample returns (weighted average return of the sample of companies) from the base period to the time of their listing. This need not be necessarily true, but, given the impasse, this according to us, was the best way to overcome the problem.

● ***Deciding on the base period***

The 'Harshad Teji', as it is known, completely distorted all past stock market data simply because the driving force in that rally was a guy with stolen funds ie funds at near zero costs (barring a few bribes here and there). All attempts at historical analysis get foiled because of the unprecedented rally in '92. The fear of landing up with an unrealistic base period haunted us for quite some time. But this is how we got over it.



The criteria for selecting the base period was to go back a sufficient number of years in the history to iron out short term blips. Yet we could not go too far back as we needed to have easy access to annual accounts of companies.

We initially took April 1, 1992 (any association with fools may not be coincidental) as our base period because it satisfied our above mentioned criteria. But the problem with this period was that the Big B had already started moving the markets to unrealistic levels. Hence, this date would distort the study to a great extent.

So, we decided to go a few months back in time to find a stable period in which the Sensex had not been very volatile. December 6, 1991 came out as our final choice as the base period.

April 10, 1997 was frozen as the terminal period for the price data, while the report was under preparation.

● *Calculating stock and sample returns*

Once the sample and the period for the study was finalised, individual stock returns were calculated by adding future value of dividends (using a reinvestment rate of 18%) to the terminal market price and finding the CAGR of the revised stock price (adjusted for Bonus issues and dividends).

For companies such as the PSUs which were listed after the base period, the CAGR was computed for the shorter period (ie from the time of listing to the terminal period). Most PSU stocks were extremely thinly traded at the time of listing due to the concentrated shareholding and the listing prices were not representative. In the case of BPCL and HPCL, since the price volatility was very high on listing (the listing was at a high price and then the prices kept falling thereafter) we have taken lower stable state prices as base prices. In case of VSNL, again, the price volatility on listing was very high. Hence, we have taken a higher stable state price (the listing was at a lower price and then the price kept rising) as base price.

The average sample returns were calculated by taking a weighted average stock returns of the sample – weightages were based on the market cap of companies in the base period.

● *Financials for the sample companies*

Ideally, the back calculations should have been done taking into account market expectations of earnings and cashflows at that point in the past. However, given the rather short history of formal equity research in India, it was impossible to get a handle on past market expectations. Therefore, we worked with actual earnings as a proxy for expectations.



● ... *And then came the number crunching*

Various valuation ratios (which are discussed below in brief) were computed. The objective was to try out most commonly and not so commonly used ratios/tools to see which of them were useful in explaining and therefore, eventually predicting stock returns for our sample. And for all the valuation ratios discussed below, FY92-96 ('91-'95 for Dec. ending companies) was taken as the period with which the stocks returns were compared.

To find out which tool has worked over the long term, we used some statistics. We ran regressions-single and multiple – to test each individual tool like P/E, P/CEPS, Lynch ratio, growth adjusted P/E, degree of undervaluation etc. against returns given by each stock. Wherever necessary, we also tried out mathematical variations of these ratios (eg 1/Lynch ratio) to see if these had a better fit with returns.

Definition of the various valuation tools and notations used

First came the conventional ones

- *P/E, P/Book Value (P/B), P/CEPS etc.*

The prices are as of Dec. 6 '91 and the earnings are for FY92.

- *EPS growth and PAT growth*

For both EPS and PAT growth we have taken FY92 as the base year and FY96 as the terminal year. Bonuses have been adjusted accordingly in the calculation of EPS growth.

- *EV / EBIDTA*

Enterprise Value is calculated by adding debt to market cap. We have added debt as of the end of FY92 to the market cap of Dec. 1991 (taking FY92 equity and Dec. 91 prices).

- *Discounted RoE*

Instead of using a single period RoE, we felt, it would be better if we took the average RoE for the period FY92-96. The average has been calculated by dividing the discounted PAT for FY92-96 by the discounted networth for the same period.



- ***Discounted ROCE***

The only difference between ROCE and RoE is that the denominator is taken as capital employed instead of networth and post tax interest cost is added to PAT in the numerator.

- ***Lynch ratio***

This ratio seeks to capture the relationship between the P/E and the growth in EPS over the next few years. It is calculated as the P/E ratio (prospective) divided by the EPS growth. The interpretation of ratio is: the lower the ratio, the cheaper is the stock (obviously). But, this ratio can fail under two circumstances. First, a company can have a healthy EPS growth if it funds its expansion from debt. This would increase the company's risk profile which does not get captured in the ratio. And secondly, equity capital can be raised at a high premium, as has been done by a number of companies in our sample – this would result in a strong EPS growth despite a falling trend in RoE, which would again not get captured in the ratio. Hence, one should look at this ratio in the light of the above two drawbacks.

.... then was First Global's twist to some of these tools in the form of Growth Adjusted P/E, P/CEPS and EV/EBIDTA

- ***Growth adjusted EPS, CEPS & EBIDTA***

The period taken to calculate these figures was FY92-96. The value of each of these numbers is the weighted average of their value for the each of the 5 years where the weights are the discount factors for respective years (discount rates used are WACC for growth-adj EBIDTA and Cost of Equity for EPS and CEPS). Thus the growth adjusted EPS is defined as

$$\frac{\text{FY92 EPS} + \text{FY93 EPS}/(1+r) + \dots + \text{FY96 EPS}/(1+r)^4}{1 + 1/(1+r) + \dots + 1/(1+r)^4}$$

where r is the Cost of Equity of the company. The Market Price of the stock was then divided by this growth adjusted EPS to give the growth adjusted P/E. Similar calculations were done for Growth Adj. P/CEPS and EV/EBIDTA.

...then came the DCF based on free cashflow analysis

Here is the methodology and glossary of terms for the free cash flow analysis.



● ***NOPLAT***

It is an acronym for Net Operating Profits Less Adjusted Taxes. It is derived as earnings before interest and taxes but after depreciation (EBIT) less adjusted taxes. Adjusted taxes being defined as actual tax paid less tax on other income plus tax shelter on interest.

● ***Operating Cash Flow (OPCF)***

Operating cash flow is the cash flow after deducting increase in working capital from NOPLAT.

● ***Free Cash Flow (FCF)***

Free cash flow is the cash flow left after deducting the sums spent on capex (net of depreciation for the year) from operating cash flow. It represents the sums available to debt and equity holders.

● ***Fair Value***

The DCF method basically consists of discounting this projected free cash value for the entire life of the company, adjusting it for liquid assets currently available in the balance sheet to give the firm value. This firm value is then adjusted for debt to give the value of future cashflows available to equity holders. This can then be converted into a per share 'fair value'.

● ***Degree of undervaluation on DCF Value bases (DoU)***

It is defined as the ratio of the difference between the fair value and the stock price to the fair value of the stock ie

$$\frac{\text{DCF Fair Value} - \text{Market Price}}{\text{Fair Value}}$$

In other words, DoU was the difference between DCF Fair Value and Market Price over Fair Value of the stock in Dec. '91. A negative value meant that the stock was overvalued, whereas a high positive value meant that the stock was substantially undervalued.

● ***Choice of Cash Flows***

As mentioned earlier, we would have liked to use cashflow projections as of Dec. '91 for our calculations. However, given ground realities, we have used actual (reported) cash flows of the company from FY92 -96 and used projections thereafter. This assumes that the market was very efficient then and the reported earnings were anticipated by the market well in advance (in short, there were no surprises).

However, this would not have necessarily been the case in companies such as Thomas Cook, HLL, Castrol etc. which reported positive earnings surprises which were not likely to be anticipated by the market then. Hence,



these stocks have returned far more than the average sample return (due to interim changes in the company profiles) and it also explains the apparent heavy undervaluation of these stocks then. (See Chapter IV for a detailed discussion of this phenomenon).

The market, however, logically seems to have revised the projections in the interim period based on actual changes in business profiles and reported earnings. This has been the case for the stock returns also. Individual stocks moved up and were revalued by the market in a short span of time to incorporate the revised business profiles and cash flows. Hence, for most of these stocks, timing of entry was a crucial factor for outperformance.

● *Discount Factor*

For all the above calculations, we have used the post tax WACC for discounting Free Cash Flow, Cash Flow from Operations, EBIDTA, RoCE and Cost of Equity for EPS, EPS, RoE.

For calculating the base or market cost of equity, we've been working with a 7-7.5% risk premium over the risk free rate which is defined as the long-term T-bond rate. At present, this will translate into a cost of equity of about 20% (risk free rate of 12.5-12.75%). Back in 1991, the T-bond rate was more than a percentage point lower than the current rate. However, given the macroeconomic situation of the country, we'd probably have used a higher risk premium which would've translated back to a 20% Cost of Equity.

Why Look At Short/Medium Term Cash Flows ?

While we have been comfortable with the use of discounted cash flow techniques to value an asset or a stock, one niggling problem had been nagging us for some time. In the DCF technique, a large part of the total value is accounted for by the terminal value. While there is nothing, per se, wrong with this, we felt that the market may be giving some extra weightage to earnings and cashflows that would accrue to investors over the next few years i.e. the explicit period. It seemed unlikely that the market would totally ignore the timing of cashflows even if they had the same discounted value simply because explicit period earnings were more predictable and visible. It was at least a hypothesis worth testing.

To test our hypothesis, we defined this ratio:

● ***Discounted Operating Cash Stream (DOCS) over 4-5 years as a percentage of the Market Price (additionally explained in Chapter-II)***

The objective behind calculating this ratio is to find out whether the stocks that have high Operating Cash Flows (OPCF) in the explicit period (in this case FY93-96) outperform the market or not. In short, does the market give greater weightage to the short term cash flows relative to good long term cash flows or not.

To recap, OPCF is defined as EBIT less Adjusted Taxes less increases in working capital. These numbers were calculated for each year of the explicit period.



For calculating 4-year Discounted Operating Cash Stream/Market Price (DOCS/MP), we first calculated the discounted value of OPCFs in the explicit period (FY93-96) plus liquid assets at the end of FY92 as percentage of total firm value. This ratio is taken as an approximation for the ratio of the cashflows to equity holders in the explicit period to the fair value. This ratio can then be easily recomputed with market price to get the 5-year DOCS as a percentage of market price. We also tried out the same analysis with post-capex cash flows with much poorer results as apparently the market looks at lower or negative cash flows due to capex differently from its interpretation of a reduction due to operating flows (unless the capex does not add economic value).



IX. Pay dirt : What worked best on Dalal Street

We started out by running single factor regressions with stock returns as the dependent variable and all the ratios mentioned in the previous chapter, as well as their mathematical variations, as independent variables. However we found that no single tool moved in tandem with returns. *No single factor explained more than 62% of the stock returns. The only tool that had a R-squared of close to 62% was the degree of under-valuation on a DCF basis. The more widely used tools like P/E and P/CEPS etc were found to be among the least effective tools for explaining stock returns.*

The results of the single regressions are given below in descending order:

Dependant variable : Compounded Annual Stock Returns over Dec.'91 to Apr.'97.

Independent Variable	R ²
Degree of Undervaluation on DCF basis #	61.7%
DOCS/MP *	40.2%
Inverse of Lynch Ratio**	38.8%
Lynch Ratio **	26.9%
Gr. Adj. E/P	26.9%
RoE	25.6%
RoCE	22.3%
EPS growth	22.0%
Gr. Adj. P/E	21.9%
P/E	6.9%
NOPLAT growth	6.7%
P/B	4.3%
PAT growth	3.0%
P/CEPS	1.3%

* This regression was run on a sample of 48, eliminating companies with skewed ratios and finance companies.

** This regression was run on a sample of 52, eliminating companies with a negative ratio.

Mathematically transformed to a market price base.

What is evident was that conventional ratios like P/E, P/B and P/CEPS performed the worst in predicting returns. In fact, we tried their variants like inverses and came up with equally poor results. After the degree of undervaluation, was DOCS/MP, the medium-term Operating Cash measure and then the ratios which tried to combine the P/E ratio with the earnings growth ie variants of the Lynch ratio and the growth adjusted P/E ratio.



There were various relationships between the independent variables that were tried out. Like P/B and RoE, P/E and EPS growth etc. Relationship between price to book and RoE was not very significant. Also, the R² between P/E and EPS growth was not high indicating that a high P/E may not always be a proxy for high EPS growth.

The caveat in this, as in any other regression analysis, is that just because one does not get a high R-squared for a particular group of variables, it does not mean that the variables are not related. They may actually be – and that too to a high extent, but, the relationship may not be linear – it may be curvilinear. What a low R² means is that there is no linear relationship – it does not eliminate the possibilities of other types of relationships. However, a study of the scatter diagrams did not indicate any strong curvilinear relationships, either.

Then came the tough part as the degree of undervaluation (transformed) alone explains (moves in tandem with) only about 62% of the stock returns. Given our naturally dissatisfied nature, we wanted to increase this percentage. So we tried out scores of permutations and combinations to improve R-Squared and reduce Standard Error. *What we finally arrived at, were five variables that, in combination, explain most of the stock returns – over 75% of it – not too bad a number, is it? These were degree of undervaluation (transformed), DOCS as a percentage of market price, the inverse of growth adjusted P/E, RoE and RoCE. (There is not much to choose between RoE and RoCE and hence we confined ourselves to RoE).*

In combination, these variables explain over 75% of the stock returns. The t - coefficients are significant for all these five variables. The standard error for the combination is about 9.42%. For the multiple regression using 4-yr. DOCS/MP as one of the variables, we have dropped companies which are outliers with respect to this variable. Madras Cements has been dropped because of very high 4-yr. DOCS/MP while BSES and Thomas Cook have been dropped because of their negative values.

Regression of stock returns against degree of undervaluation, growth adjusted E/P, 4-yr. DOCS/MP and RoCE

<i>Regression Output</i>				
Constant	-0.0303			
Std Err of Y Est	0.0943			
R Squared	0.7698			
No. of Observations	48			
Degrees of Freedom	43			
	Degree of Undervaluation on DCF basis (transformed)	Gr. Adj. E/P	4-yr. DOCS/ MP	RoCE
X Coefficients	0.0549	0.6550	0.2545	0.5607
Std Err of Coef.	0.0100	0.2581	0.1145	0.1829
t - value	5.4735	2.5373	2.2235	3.0666
f - value	49.04			

**Regression of stock returns against degree of undervaluation, growth adjusted E/P, 4-yr. DOCS/MP and RoE****Regression Output**

Constant	-0.0294
Std Err of Y Est	0.0965
R Squared	0.7585
No. of Observations	48
Degrees of Freedom	43

	Degree of Undervaluation on DCF basis (transformed)	Gr. Adj. E/P	4-yr. DOCS/MP	RoE
X Coefficients	0.0554	0.6557	0.2566	0.4336
Std Err of Coef.	0.0103	0.2645	0.1172	0.1644
t - value	5.3721	2.4790	2.1888	2.6381
f - value	46.07			

What does DOU (transformed) mean ?

Our conventional definition of Degree of Undervaluation is:

$$\frac{\text{Fair Value} - \text{Market Price}}{\text{Fair Value}}$$

This definition makes intuitive sense, because a stock is to be at a premium or discount to its fair value – and is easier to understand. For example, Bajaj Auto’s Fair Value is around Rs.1200 – its market price is Rs.900. Therefore, it is trading at a 25% discount to its fair value.

The co-efficient of correlation in the regression between conventional DOU and historical stock returns is 42.78%. However, when we ran the regression with stock returns and a mathematical variant of DOU called “DOU (transformed)” we got an improved correlation of 61.69%.

We defined DOU (transformed) as :

$$\frac{\text{Fair Value} - \text{Market Price}}{\text{Market Price}}$$

This can be explained thus:

In the above example, you could restate the undervaluation by saying that Bajaj Auto’s Fair Value (Rs.1200) is 33.3% higher than its market price (Rs. 900). This what we mean when we write “DOU transformed”. Both are exactly the same in every sense - just the way of stating the undervaluation is different.

Because of the better fit achieved by the DOU (transformed), we chose to use this term for our regressions instead of the DOU.

For the mathematically minded, one can easily arrive at the DOU (transformed) from the DOU by using the equation:

$$\text{DOU (transformed)} = \frac{\text{DOU}}{(100-\text{DOU})}$$

$$\text{In the above example DOU (\%)} = 25$$

$$\text{Therefore DOU (transformed) (\%)} = \frac{25}{100-25} = 33.3$$



X. Scatter Diagrams (Graphs of Regressions)

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Note : List of abbreviations used is available in Annexure III.