COMMON MEASURES OF VALUE MANAGEMENT

**A WORK IN PROGRESS PAPER PREPARED BY THE
VALUE MEASUREMENT WORKING PARTY:**

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Terms of Reference

To investigate some common measures of value used outside life assurance, and analyse the potential for improving these by applying actuarial principles and risk concepts, illustrating this with worked examples. This Paper represents work in progress, with the aim being to investigate additional measures and test further data, focusing particularly on the potential for applying real options techniques to securities investment.

Summary

Many metrics are used every day as useful measures of value outside the life sector by a range of professions. These tools are used to value customers, contracts and businesses either for directing strategy internally, reporting to external shareholders, or pricing transactions. This work follows on from the 2001 SIAS paper "Do actuaries know how to measure value?". The Working Party has selected a number of these for more detailed analysis, to investigate if actuarial techniques, or the incorporation of risk or options theory might improve these measures. Work done up to the time of the Conference has focused on measures used in securities analysis such as the Price Earnings to Growth ("PEG") ratio and Price Earnings Relative ("P.E. Rel"). Weighted Average Cost of Capital ("WACC"), and Compound Annual Growth Rate ("CAGR") will also be examined.

The Working Party decided to avoid topics that have been well researched by other groups, either in areas such as pure investment research or project appraisal. Also, the group will avoid areas that appear to be mainly accounting issues, such as definition of earnings, or use of EBIT/EBITDA. The focus is on areas that are amenable to actuarial analysis, where ratios might be improved by using discounting of returns or allowing for variability/risk on a stochastic basis. Unfortunately, very few ratios have been found that were internal to commercial companies and also well defined. Some concepts within companies, used by consultants and management, still do not appear to be well operationalised. Most of the interesting ratios were in securities analysis, and were measures of relative value.

Initial investigation of the PEG ratio highlights the systematic way in which it overvalues high growth companies and under-rates low growth ones. Also, there is a clear pattern by securities analysts of a very short term approach to calculating growth rates, with little supporting rigour, and a tendency to extrapolate prospective returns for one or two years into longer terms. For growth businesses and smaller companies, many securities analysts base recommendations on low PEG strategies. One such list is reviewed in Appendix A. There is scope to build on good US research on PEG ratios by testing these models with British data. Also, the Working Party will investigate the use of Real Options' approaches to handle discontinuities in risk and discount rate.

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PRICE/EARNINGS TO GROWTH "PEG"

The Price/Earnings to Growth ratio has been increasingly used by securities analysts over the past five years, gaining popularity during a background of stronger economic growth. Two assumptions are involved in calculating the ratio; forecast earnings and projected long term growth rate. Typically, the P/E ratio is derived from the current share price and next forecast earnings per share, and then divided by a projected earnings growth rate. Although usually cited as a long term growth rate, often only short term evidence is offered for the earnings growth rate, with investment analysts citing prospective periods of one to five years.

There appears to be a bias in terms of use by investment analysts to refer to PEGs in respect of companies estimated to have particularly high earnings growth. Analysts covering slower growing companies where growth may appear less important in valuation, make less use of the ratio. The company reference service now publishes estimated PEG ratios for all UK shares.

Problems with the PEG ratio are clear from the analyses in Appendix A. The first analysis, uses a deterministic discounting of earnings. This makes no distinction between earnings and dividends, effectively assuming 100% earnings distribution. A range of growth rates is used, with calculations alternatively either assuming zero growth after five years or a fade to 5%.   The latter produces extremely high discounted cash flow valuations relative to the P/Es which would be determined by a PEG ratio of 1. Effectively, for high growth companies, and discount rates at 8%, the PEG ratio would be more than 3. It is only with discount rates at 11% and above, and assumed zero growth rate after five years, that the PEG ratios of 1 are in line with DCF valuations for higher growth companies.

PEG ratios calculated by Discounted Cash Flow of earnings relative to an assumed PEG ratio of 1

	DCF P/E ÷ P/E if PEG = 1			
5 year growth rate p.a.	6 years + ; g/r = 0 Disc Rate 8%	6 years + ; g/r = 5% Disc Rate 8%	6 years + ; g/r = 0 Disc Rate 11%	6 years + ; g/r = 5% Disc Rate 11%
2.5%	5.6	7.4	4.0	4.8
7.5%	2.3	5.2	1.6	2.6
10%	1.9	4.4	1.4	2.2
15%	1.5	3.6	1.1	1.8
20%	1.4	3.3	1.0	1.6
30%	1.3	3.2	0.9	1.6

Most analysts describe PEG ratios of up to 1.25 times for growth companies as being attractive. For example, technology on average has traded at PEG ratios between 0.71 and 1.47 over the past decade (Reuters, 3.1.02), with some individual companies at the peak of the technology bubble in 2000 having higher individual PEGs. Interestingly, these calculations suggest that, it is low growth companies that are systematically under-rated by the PEG ratio analysis. These companies should be priced higher relative to that low growth than a PEG ratio of 1 or less would imply. Areas for further investigation include discriminating in the DCF analysis between actual dividends paid to recognise the lower risk involved in earlier cash receipts by investors. For FTSE 100 companies, yields average 2.9%, but range up to 8.4%. 15 companies have currently dividend yields exceeding 5%, and eight pay no dividends (19.6.2002). Also, option theory could be applied to the terms on which further capital might need to be raised by growth companies. Rather than assuming a fixed growth rate, realistically the implication of a higher future cost of capital could be examined.

For example, analysis of a recommended list of European shares in May 1997 in terms of subsequent performance over the following five years, shows little discrimination. This example was chosen as offering one of the most fully specified calculations, taking two years actual historic earnings per share growth and projecting forward two further years. By contrast, typically securities analysts simply state a figure as either the prospective growth for the current year, or for two years.

Outcome of selected European shares recommended in 1997 on basis of low PEG ratios

PEG Ratio	Five year performance
< 0.5	32.1
0.5, 0.6	34.1
0.7	30.6
0.8	-29.7
1.0	30.2

Data: Appendix A.

AREAS FOR FURTHER INVESTIGATION

The Steering Group involved in preparing the 2001 "SIAS" Paper on Value Measurement conducted a survey of practitioners outside the actuarial profession using value methods. This identified some areas for further examination, but also highlighted that many consultants appeared to use a range of tools, with less stress on academic rigour. Some of the possible areas for study that are being considered by the Working Party are listed in Appendix D. In a number of cases, there is good existing and recent research from the US, that has not yet been tested on UK or European stockmarket data.

APPENDIX A : PEG Ratio, Comparison with Discounted Cash Flow (or Earnings per Share Calculations)

Growth rate % for Yrs 1 to 5	Growth rate % Yrs 6 on	Assumed Fair P/E (PEG=1)	DCF Value Discount at 8%	DCF P/E /Fair P/E
0.0	0.0	0.0	12.5	N/M
2.5	0.0	2.5	13.9	5.56
5.0	0.0	5.0	15.5	3.10
7.5	0.0	7.5	17.1	2.28
10.0	0.0	10.0	19.0	1.90
12.5	0.0	12.5	21.0	1.68
15.0	0.0	15.0	23.2	1.55
17.5	0.0	17.5	25.5	1.46
20.0	0.0	20.0	28.1	1.41
22.5	0.0	22.5	30.9	1.37
25.0	0.0	25.0	33.9	1.36
27.5	0.0	27.5	37.1	1.35
30.0	0.0	30.0	40.6	1.35

Growth rate % for Yrs 1 to 5	Growth rate % Yrs 6 on	Assumed Fair P/E (PEG=1)	DCF Value Discount at 8%	DCF P/E /Fair P/E
0.0	0.0	0.0	12.5	N/M
2.5	2.5	2.5	18.6	7.44
5.0	5.0	5.0	35.0	7.00
7.5	5.0	7.5	39.1	5.21
10.0	5.0	10.0	43.6	4.36
12.5	5.0	12.5	48.6	3.89
15.0	5.0	15.0	54.0	3.60
17.5	5.0	17.5	59.8	3.42
20.0	5.0	20.0	66.2	3.31
22.5	5.0	22.5	73.1	3.25
25.0	5.0	25.0	80.6	3.22
27.5	5.0	27.5	88.7	3.23
30.0	5.0	30.0	97.5	3.25

Growth rate % for Yrs 1 to 5	Growth rate % Yrs 6 on	Assumed Fair P/E (PEG=1)	DCF Value Discount at 11%	DCF P/E /Fair P/E
0.0	0.0	0.0	9.1	N/M
2.5	0.0	2.5	10.1	4.04
5.0	0.0	5.0	11.1	2.22
7.5	0.0	7.5	12.3	1.64
10.0	0.0	10.0	13.6	1.36
12.5	0.0	12.5	14.9	1.19
15.0	0.0	15.0	16.4	1.09
17.5	0.0	17.5	18.0	1.03
20.0	0.0	20.0	19.8	0.99
22.5	0.0	22.5	21.7	0.96
25.0	0.0	25.0	23.7	0.95
27.5	0.0	27.5	25.9	0.94
30.0	0.0	30.0	28.3	0.94

Growth rate % for Yrs 1 to 5	Growth rate % Yrs 6 on	Assumed Fair P/E (PEG=1)	DCF Value Discount at 11%	DCF P/E /Fair P/E
0.0	0.0	0.0	9.1	N/M
2.5	2.5	2.5	12.1	4.84
5.0	5.0	5.0	17.5	3.50
7.5	5.0	7.5	19.5	2.60
10.0	5.0	10.0	21.6	2.16
12.5	5.0	12.5	23.9	1.91
15.0	5.0	15.0	26.5	1.77
17.5	5.0	17.5	29.2	1.67
20.0	5.0	20.0	32.2	1.61
22.5	5.0	22.5	35.4	1.57
25.0	5.0	25.0	38.9	1.56
27.5	5.0	27.5	42.7	1.55
30.0	5.0	30.0	46.8	1.56

FTSE Companies; P/E & PEG ratios 18.6.02, per Bloomberg

	Size Rank	Hist. P/E	IBES PEG		Size Rank	Hist. P/E	IBES PEG
SAB	54	19.7	0.4	ULVR	13	35.7	3.0
BG	23	17.2	0.8	RTO	49	19.8	3.0
AAL	15	8.1	0.9	DGE	11	23.0	3.1
NXT	76	16.3	1.0	PRU	21	36.2	3.1
Group Average		**15.3**		WPP	34	25.6	3.1
				BNZL	94	19.8	3.1
EMG	78	16.5	1.1	GUS	39	25.0	3.2
ABF	51	20.0	1.2	BAA	38	18.4	3.2
NRK	82	14.5	1.2	HNS	64	22.5	3.5
SFW	75	12.0	1.3	MKS	30	20.6	3.7
SGE	99	24.9	1.3	CPG	26	59.0	3.9
HAS	84	17.9	1.4	BOC	46	20.3	3.9
Group Average		**17.6**		KGF	57	27.6	3.9
				Group Average		**27.2**	
LLOY	8	14.7	1.5				
HBOS	10	16.2	1.5	EXL	89	32.2	4.1
AVZ	55	29.8	1.5	BP	1	22.2	4.2
SHP	83	65.6	1.5	SXC	41	14.5	4.3
SHEL	7	16.0	1.6	ICI	68	23.0	5.3
ALLD	52	13.4	1.6	SPW	36	42.1	6.9
CBRY	24	17.4	1.7	SCTN	47	54.9	10.3
STAN	29	19.2	1.7	REL	32	129.1	11.7
AHM	61	17.1	1.7	RTR	43	123.6	13.4
RBOS	5	27.2	1.8	FP	87	84.1	16.8
TSCO	14	20.6	1.9	PWG	48	100.1	17.2
DXNS	62	23.8	1.9	GKN	90	236.9	21.5
Group Average		**23.4**		SMIN	53	102.5	35.7
				CGNU	19	421.1	140.4
HSBA	3	19.3	2.0	**Group Average**		**106.6**	
IMT	31	19.3	2.0				
BLND	77	19.0	2.0				
AUN	96	22.0	2.0				
CAN	25	26.4	2.1				
RB	33	24.8	2.1				
SBRY	37	18.5	2.1				
BARC	9	15.0	2.2				
WOS	63	15.5	2.2				
CPI	91	66.9	2.2				
BOOT	45	14.0	2.3				
MRW	73	21.0	2.3				
RR	85	25.4	2.3				
Group Average		**23.6**					
BATS	16	17.1	2.5				
RIO	17	23.6	2.5				
JMAT	93	20.9	2.5				
GLH	60	17.3	2.6				
HG	67	25.8	2.6				
ANL	20	9.8	2.7				
SN	71	34.4	2.7				
AZN	6	25.3	2.8				
SSE	44	13.5	2.8				
ALLD	59	14.4	2.8				
GSK	2	27.8	2.9				
LAND	50	18.6	2.9				
Group Average		**20.7**					

Performance of Recommended Low European PEG ratios (5 Years)

	EPS GROWTH AVGE (B)	PER 1998 (A)	PEG RATIO (A/B)	% Share Performance to Date (5yrs)
Gucci	85.5	18.0	0.2	64.5
BASF	52.8	14.2	0.3	41.6
Michelin	28.4	7.9	0.3	-17.6
Telecom Italia	30.0	9.8	0.3	153.4
Esselte	26.6	10.4	0.4	-27.8
Telecom Italia Ord	30.0	12.0	0.4	42.3
WM-Data B	42.9	18.8	0.4	-31.5
Average				**32.1**
Telecom It Mob Ord	50.8	23.2	0.5	54.0
AGF	25.6	11.7	0.5	73.9
Stork	21.7	13.1	0.6	-72.2
Hoechst	23.8	14.5	0.6	138.5
Fischer	16.5	10.7	0.6	-23.7
Average				**34.1**
UCB	31.4	21.6	0.7	56.5
Hunter Douglas	20.5	14.3	0.7	-18.9
ABN/Amro	16.5	11.8	0.7	10.5
Telefonica	20.5	14.8	0.7	22.9
Tomra	44.0	32.1	0.7	42.3
Oce	27.2	19.8	0.7	18.0
Nutreco	28.0	21.0	0.7	82.7
Average				**30.6**
Moevenpick	21.7	16.5	0.8	26.7
SGL Carbon	23.6	18.2	0.8	-82.5
EVN	14.6	11.3	0.8	18.2
Getronics	29.5	24.7	0.8	-81.3
Average				**-29.7**
BBVA	17.2	16.7	1.0	67.0
Ericsson B	24.0	23.4	1.0	-54.7
Pinault Printemps	20.6	20.2	1.0	62.1
VNU	17.7	17.6	1.0	46.6
Average				**30.2**
FTSE Euro 300 ex UK				**34.5**

Source: DKB Research May 1997
PEG: 4 year average t-2 to t+2, EPS t+1

APPENDIX B : VALUING COMPANIES AND OPTIONS

Options theories might be applicable to evaluating companies where there were discontinuities in cost of capital, such as dotcoms, and even leveraged individual companies that need to raise new capital. For such companies, requiring further external capital, DCF techniques applied by analysts to not appear to recognise discontinuities in risk and cost of capital.

Options not commonly explicitly valued

Assets

1.   Lender of Last Resort

        Is the company too big to be allowed to fail?

2.   Limited Liability Status

        Shareholders are only liable up to subscribed capital.

3.   Merger and Acquisition Synergies

        Is the break-up value greater than ongoing value?

Liabilities

1.   Managers' and Employees' Options

        Rewards may be misaligned with shareholders' longer term interests?

2.   Pension Scheme Options

        Cost of guarantees to become more explicit with FRS17.

3.   Customer and Public Options

        Product liability, misselling claims, guaranteed terms for future sales.
        Retrospective regulation, windfall taxes, environmental and societal damage litigation.

4.   Contingent Liabilities

        Off-balance sheet liabilities or guarantees that only crystallise in particular outcomes.
        Warrants, debt covenants, credit downgrade triggers for collateral etc.

5.   Winding Up Costs

        Not all net assets are accessible on wind up, and perhaps not at disclosed value.

Merton's Model

(formulae from Hull "Options, Futures and other Derivatives 4th Ed." p630).

This is a highly schematic method of arriving at the equity value of a company, E(0), given the face value of outstanding debt, D, and current market value D(0).

Say debt matures at time T and equity value at T is E(T)
Say total assets of company so eg. V(0) = E(0) + D(0)
Say risk-free interest = r, volatility of V = vol(V)

Then treating E as a call option on underlying V expiring at T with strike D,

E(T) = max (V(T) – D, 0) so from Black-Scholes

E(0) = V(0).N(d1) – D.exp(-rT).N(d2)   ….[A]

Where N(d1), N(d2) are functions of V(0), r, vol(V), T

Our two unknowns are E(0) and vol(V), so we need one more equation, which comes from Ito's Lemma:

vol(E). E(0) = N(d1).vol(V).V(0)   ….[B]

and we can estimate vol(E).
We can therefore estimate E(0) from [A] and [B].

APPENDIX C : The Steering Group Survey

The Steering Group that wrote "Do actuaries know how to measure value?" conducted a series of interviews to find out what was actually going on in the outside world, in particular:

- To find out what Value Measurement products people were selling, where, and how they were applied; and to draw appropriate conclusions;
- To gather together any methodological material, academic or otherwise, identified in the process.

The work to date has focused mainly on a survey of consultants offering Value Measurement services. The five firms surveyed cover a significant portion of the market, but later work could cover others, as well as with users of their services.

- Arthur Andersen
- Cap Gemini Ernst & Young
- McKinsey
- PricewaterhouseCoopers
- Stern Stewart

Noteworthy issues to emerge from working party discussions and/or the results of our survey are discussed below under the following headings:

- Motivations for introducing Value Measurement
- Measurement techniques & methodology
- Application areas
    - Types of business sectors
    - Products/services and application areas
- Future developments
- Areas of potential interest for the actuarial profession

Motivations for introducing Value Measurement

It is clear that behind all Value Based Measurement ("VBM") initiatives is the wish to align the interests of businesses and their staff more closely with those of shareholders. It is possible to identify two distinct reasons (or categories of reasons) for companies to introduce VBM programmes:

- A sense on the part of managers that the market may understate their company's potential. This is tied in with accounting issues, shareholder relations and communication and growing investor sophistication.

- A wish to bring about change within an organisation that reflects the interests of shareholders. This ties in with management accounting and capital allocation, investment appraisal and remuneration systems.

Both of these motives may of course be present in any particular case; equally there are pressures on companies to pay at least lip service to VBM techniques. This has perhaps been responsible for a fair amount of cynicism about the effectiveness of VBM within organisations and amongst investors.

Measurement techniques & methodology

In many ways this is a natural starting point for actuaries. Part of the motivation for our professional interest in the whole subject was the belief that measurement of value and/or value added is inherently complex. We also suspected that at least some of the work done in the area is lacking in analytical rigour and our work has not wholly laid this issue to rest. Some of the measures in common use are clearly open to criticism.

Practitioners seem to use a variety of measurement tools depending on the circumstances. It is commonly argued that the development of an appropriate tool that is applied consistently over time is more important than striving to find the optimal solution. Most also tend to emphasise that the fact of introducing a VBM programme is often much more important than choosing the optimum approach in any particular circumstances.

There is an observed trend towards the development of standard software packages. Most respondents seem to be more interested in the surrounding consultancy opportunities.

Application Areas

Businesses interested in VBM

The range of industries using VBM methods is wide and apparently increasing. In terms of sectoral interest, there seems to be a broad measure of agreement between respondents. They saw VBM as more important in capital intensive business and less so in the service sector. Sectors highlighted by respondents include:

- Telecoms
- Technology
- Commodities
- Financial Services

Although most respondents indicated interest across a wide range of sectors, one respondent emphasised the contribution of VBM in cyclical industries (e.g. commodities – electricity, oil, gas, paper, pulp – but general insurance is of course also in this category).

Another highlighted the interest within under-performing businesses, and cited building materials, retail and state enterprises.

The emphasis placed on the financial services sector is not surprising. It is clearly linked in part with the difficulty of capital allocation to lines of business, which appears to be much less of an issue in businesses with substantial fixed assets. Actuaries are already significantly involved, particularly with insurance companies, reflecting a deep understanding of the business and of the drivers of value. Extension to banking seems a natural next step.

As well as variation between sectors, there is also a regional dimension. In the US, business has by and large adopted VBM. The same is true in the FTSE-100 (but not to the same extent among the second tier of companies) in the UK. The largest new business consultancy opportunity is currently seen to be in Europe – with most interest in Germany and less in France. South East Asian businesses that wish access to international capital markets are also showing interest.

Products/Services and Application Areas

VBM services are being used to help companies with:

- Defining value adding strategies
- Identifying sources of value creation (and destruction)
- Aligning internal goals with those of investors
- Developing executive remuneration plans
- Internal management accounting systems that recognise value
- Improving investor relations
- Capital allocation (especially in financial services)
- Valuation in difficult areas e.g. brands and dot.coms
- A route in to CVM (Customer Value Management)
- Change management and implementation

The motivation behind developing VBM systems may include any or all of the above. Peer pressure and investor demand (especially in Europe in current markets) are also factors. A significant consultancy opportunity exists due to the need for specialist advice and additional resources.

Investment appraisal and cost of capital seem to be a frequent starting point. Most practitioners claim to use a range of tools, including DCF and P/E ratios. A number stressed that the choice of tools is not always critical.

One stressed the importance of education at board level, and that it is critical to make the results of VBM exercises accessible and understandable. Another cited incentives as key to effective implementation – providing the right remuneration structure and balance between the various elements. If applied correctly, it should encourage management to set stretching goals and invest in the long term growth of the business.

Benefits are seen to rise in areas as diverse as:

- Internal awareness of the fact that capital has a cost
- Greater morale/cohesion/focus
- Improved remuneration structures
- Higher share valuation

Surprisingly on the face of it, value based methodology seems to have little application to M&A transactions where more traditional measures continue to hold sway. However, one respondent characterised VBM as a response by management and shareholders to a wave of hostile takeovers in the US in the 'Eighties, aiming to show that there was another way of releasing value.

Areas of Potential Interest to the Actuarial Profession

It was positive to note that a number of practitioners noted the contribution that actuaries can and do make in the financial services sector and especially in insurance.

Much less encouraging were their general observations about the profession and our wider prospects in the VBM area (but they may see us as potential competitors!). Some saw us as defensive, expensive, over specialised and less trained than accountants in relevant disciplines such as corporate finance. We might well dispute these claims, but clearly to make significant inroads into VBM we have to overcome a perception that we are only suited to number crunching and method selection.

One area that has emerged as having considerable interest is the extension of our "analysis of surplus" methodology to new areas. It naturally generates the sources of changes in value from one valuation date to the next.

Other areas of potential interest/application for the profession include:

- Applications of Real Option theory to non-financial markets
- Analysis of Customer Lifetime Value
- Valuation of cash flow dependent/driven operations

In particular, the online betting industry appears to have a lot of detail in terms of customer statistics. The approaches appear quite deterministic and may differ widely between companies.

APPENDIX D : Possible areas for study

PRICE/SALES RATIO "P/S"

Price/Sales is a simple valuation approach; the market capitalisation of a company divided by the last 12 months reported sales figure. It is assumed that, the lower the ratio, the better. The ratio was popularised by James O'Shaughnessy in "What Works on Wall Street". He evidenced from US data that stocks with low P/S outperformed those with low P/E ratios. O'Shaughnessy found that the P/S approach performed best for large companies and was less useful for those with high operating margins. P/S of no more than 2 times was assumed to be cheap, and he recommended the ratio was best used in comparisons within the same sector. It flatters young companies with sales but no earnings and those with potential for margin improvement. By using reported sales, accounting treatment for profits and earnings per share is not able to distort the calculation. However, it would still suffer from flexibility in accounting treatment on revenue recognition. Also, the patterns of operating profit margins will vary between industries, and Price/Sales ratios for these industries could persist in the long term above or below the overall average level. Using Enterprise Value as a proxy for price would correct for distortions in capital structure – the ratio otherwise flatters companies with a greater proportion of debt.

ENTERPRISE VALUE / EBITDA RATIO "EV/EBITDA"

This valuation method is the ratio of Enterprise Value to EBITDA. Whereas P/E uses equity market capitalisation (as represented by share price) and ignores all other forms of financing, Enterprise Value – market capitalisation plus debt, minus cash – gives an indication of how much it would actually cost to buy the entire company. EBITDA is a measure of a company's cash-generating capability. In practice the ratio should be used when comparing companies of similar capital intensity.

Like P/S, it is potentially useful when analysing companies that lack positive earnings, particularly those with high capital expenditures. Capital-intensive industries that are described as appropriate for EV/EBITDA, include utilities, telecoms, cable and media. It could be compared with a DCF approach to earnings, and also examined for the relevance of the growth rate, in terms of period and factor measured.

CUSTOMER VALUE MANAGEMENT "CVM"

A general term describing a range of techniques that aim to improve corporate growth and profitability via measurement of the lifetime value of individual customers, and economic profit created. This typically involves database analysis and identifying true costs of customer acquisition. Most metrics do not allow for risk

AVERAGE REVENUE PER USER "ARPU"

Used in telecoms, but there seems to be little correlation with progression of business value.

REGULATORY ASSET VALUE "RAV"

Used as discernible profitability over the longer term for regulated utilities. However calculation requires assumptions of cost of equity and adjustments for variability of earnings are not transparent. It is not clear what is the sensitivity to equity risk premium.

PROJECTED EVA

Used in securities analysis, but it is not clear what discount rates, terminal value and cost of capital to use.

APPENDIX E   Current UK PEG Ratios

Market Cap	No. of stocks	EPS growth %			P/E ratio	PEG
		2002 E	2003 E	2004 E	2001 E	
£50m to £100m	81	6.0	3.2	11.2	11.6	1.6
£100m to £175m	84	7.2	15.9	15.2	14.0	0.9
£175m to £300m	71	12.2	13.1	14.6	15.5	1.1
£300m to £600m	88	7.1	13.9	10.9	16.2	1.3
£600m to £1.5 bn	84	3.3	15.1	12.0	14.5	1.1
over £1.5 bn	119	1.7	11.7	9.4	17.3	1.6

Source: I/B/E/S consensus estimates, CSFB Research (17.5.2002), PEG ratio = est.2001 P/E ÷ 2002/4 est EPS Growth

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