Cash Flow and Building Contractors

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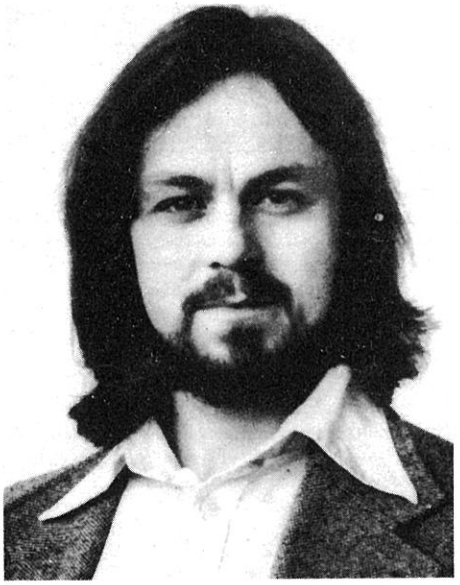

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This paper examines some aspects of cash flow in relation to building contractors. The analyses are based upon the typical project's S-curve cost and value model, as explained by Cooke and Jepson (1979), although the analysis could be applied equally to more specialised cash flow patterns.

The analysis was carried out during the early part of 1980 and so the contractual relationship between the client and the contractor has been assumed to be that of the 1963 edition of the JCT SFBC, private, with quantities edition.

Introduction

During recent years the construction industry has been forced into a state of quite severe recession, brought about by several causes both domestic and international.

The vast majority of UK contractors (in fact, all but the largest firms) operate exclusively within the domestic construction market. These firms have been affected primarily by the Government's regulation of the domestic economy. Thus by its reduction of capital expenditure the public sector's demand has declined drastically – public sector housing being an obvious example.

Private sector demand has fared little better; with the demand for construction being derived, the accelerator has operated to the detriment of the industry.

High interest rates have accentuated the industry's problems. Client organisations await a lowering of interest rates to facilitate cheaper borrowing whilst contractors must pay high rates of interest on borrowed funds at a time of enhanced competition, reducing profit margins still further.

A general aura of gloom has settled over the economy (as in the days of the trade cycle). Any organisation which can afford to build, and even has the requirements for new buildings, is reluctant to pursue an expansionist policy in such an environment resulting in the primary objective for many contractors becoming mere survival.

Much attention has recently been given to the role of cash flow, even by the courts of law, where cash flow was cited as being 'the life-blood' of the construction industry.

Perhaps the most obvious response by contractors to the prevailing situation is the reduction of profit margins, in extreme cases, their complete abolition. Where a firm obtains a contract by the submission of a tender below the full long-term costs (including normal profit) it is, strictly, buying work, although the term 'buying work' is more usually considered to be tendering below cost (normal profit being ignored). Such a policy may be supported in the short-term by numerous arguments. The dangers of buying work are great and have been discussed in detail elsewhere. Suffice it to say that liquidity is essential to contracting.

Content

This paper considers the ways in which certain policies may influence the cash flow of a typical building project.

Figure 1A.1 clearly shows that, for a typical building project, the point at which the project becomes self-financing is late in the duration of the project, a situation aggravated by the withholding of retention.

Contractors seek means by which the project may become self-financing at an earlier stage. Under international contracts, such as the FIDIC form, a site establishment payment to the contractor commonly serves this purpose.

Figure 1A.2 plots the net and maximum cash flow curves. These curves can be used to indicate the contractor's financial requirements for the project. The area between the negative portion of the net cash flow curve and the abscissa (x-axis) indicates the long-

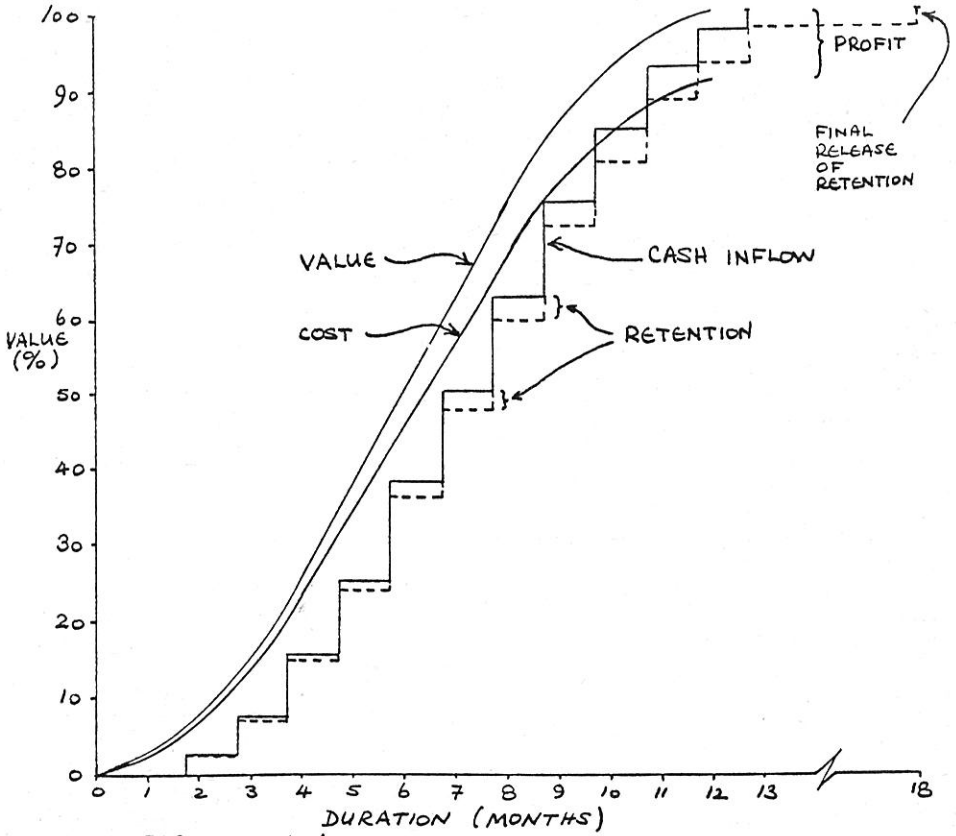

FIGURE 1A.1

term finance required. The area between the negative max. cash flow curve and the lower of either the negative net cash flow curve or the abscissa indicates the short-term finance required. The point at which the net cash flow curve becomes positive (cuts the abscissa going upwards left to right) is where the project becomes partly self-financing; the point at which the max. cash flow curve also becomes positive is where the project becomes entirely self-financing.

As the cost of the finance required to execute the project is a part of the project cost, so any means by which this cost element may be reduced must be given serious consideration.

The cost of finance is a function of the rate of interest. Any rate of interest has three components; inflation, time-preference and risk. Inflation is common to all rates of interest in a given market, at a particular time. The time-preference element is determined by the period for which the finance is required. Risk is concerned with probability of default in repayment both total default and inability to repay at the required time.

Thus in an economy, considering a prescribed time period for the use of funds, the variable differentiating the costs of the funds between possible users is risk; the greater the risk, the higher the rate of interest.

Building is a high risk industry. Clients are lower risk organisations and hence enjoy cheaper finance. Thus, if clients, instead of contractors, financed their works directly then building costs should fall by the interest differential. Of course, employers may get a better return on their capital elsewhere and be willing to sustain the interest based costs. (Alternatively, of course, tender levels might remain the same, thereby increasing contractors' profits.)

Although, under JCT contracts, interim certificates are monthly, the first cash receipt by the contractor may not occur until some time later. In this paper it has been assumed that the first valuation is carried out one month after the commencement of work on site, but a further period of 22 days expires prior to the contractor's receipt of cash.

The delay of 22 days is quite common in practice despite its being strictly at variance with the contractual provisions. (JCT '80 provisions should slightly accelerate this process.) Thus the contractor's first cash receipt occurs at about the end of week 7 and at monthly intervals thereafter.

All analyses included a delay of 22 days for cash receipts, as shown in Figure 1A.

The analyses considered models of a 'typical' contract of 12 months duration executed under the 1963 JCT contract provisions, clause 31B being applicable and the normal 5% retention applying. Fluctuations were assumed to be non-recoverable and the final account settled on time. Variations were ignored. (It is postulated, however, that variations will increase the contractor's requirement for both long-term and working capital.)

In the analysis suppliers and subcontractors' discounts were assumed to have been already allowed in the cost calculations and initially no payment delay on the part of the main contractor was included.

Four pairs of project scenarios were analysed initially, each pair comparing (i) the situation where the chosen mark-up has been strictly applied to the cost and (ii) where the mark-up has been applied in its entirety to the cost incurred during the first half of the project.

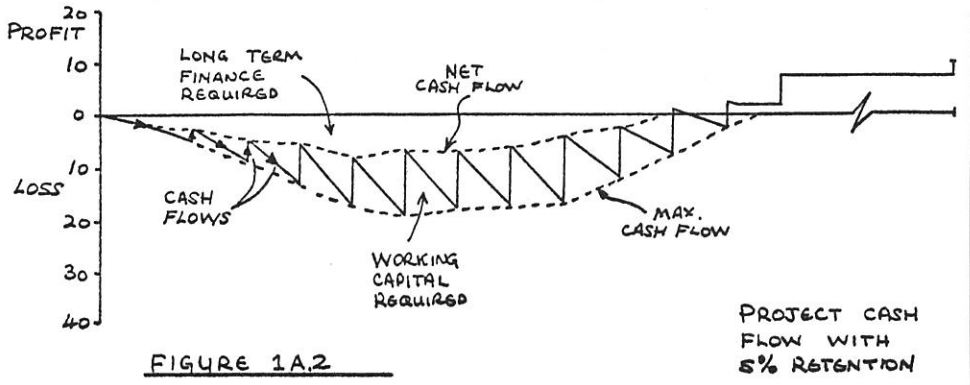

FIGURE 1A.2

Table 1: Project Variables Considered

Mark-up (%)	*Assumed Actual Inflation (% p.a.)*	*Type of Pricing*	*Payments Delay*
15	6	Normal	No
15	6	F.E.L.	No
15	6	Normal	Yes
15	6	F.E.L.	Yes
15	6→18	Normal	No
15	6→18	F.E.L.	No
15	6→18	Normal	Yes
15	6→18	F.E.L.	Yes
4	6	Normal	No
4	6	F.E.L.	No
4	6	Normal	Yes
4	6	F.E.L.	Yes
4	6→18	Normal	No
4	6→18	F.E.L.	No
4	6→18	Normal	Yes
4	6→18	F.E.L.	Yes

Footnote: Normal pricing = pricing strictly pro-rata cost by applicable mark-up percentage.

Front end loaded pricing = all profit included in first six months of project duration but applied pro-rata cost during that period.

In all cases 5% retention was deducted from cash inflows, one half being released with the payment immediately following practical completion (month 12) and the other half constituting the final payment for the project (cash inflow at month 18¾). A defects liability period (d.l.p.) of 6 months was assumed with no costs being incurred in this period, and the final payment being as above.

Two mark-ups were used in the analyses, 15% to represent a reasonable boom and 4% to represent a slump period.

Inflation was incorporated in the costs in two ways:
(i) by assuming constant 6% p.a. inflation over the contract period and including that in the cost, or (ii) by assuming constant 6% p.a. inflation and including that in the cost but then considering that over the contract period inflation increased linearly from 6% p.a. to 18% p.a. It was assumed that the costs to the contractor kept pace with inflation.

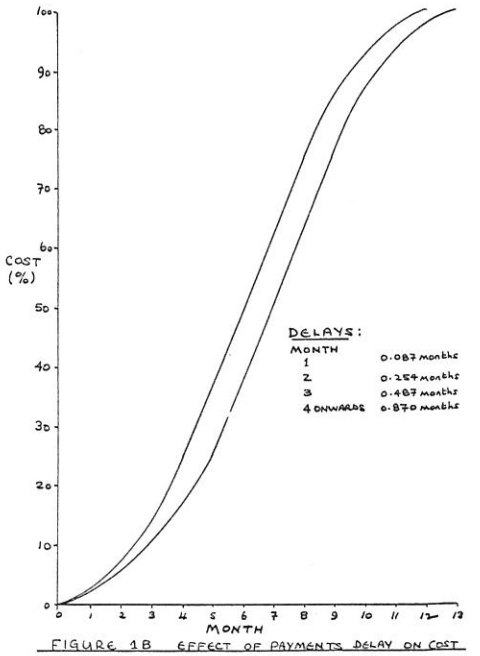

FIGURE 1B EFFECT OF PAYMENTS DELAY ON COST

An overlay technique was then used to facilitate comparison of the cash flow sawtooth diagrams, described above, with those obtained from the identical basic cost and value data for each scenario but incorporating the calculated weighted average payments delay for cash outflows from the main contractor (as calculated below).

The appropriate delay to apply to payments was calculated thus:

Cost Centre	Payment Interval	Average Delay (Wks)	Project Cost Proportion (%)	Weighted Average Delay (Wks)
Direct Labour*	weekly	$^5/_6$	10	0.08
L.O. S/Cs	weekly	$^1/_2$	10	0.05
Salaried Labour etc†	monthly	$2^1/_6$	3	0.065
Domestic S/Cs	monthly	$2^1/_6$	14	0.30
Nominated S/Cs	as JCT	4	20	0.80
Domestic Sups	as JCT nom	6	25	1.50
Nominated Sups	as JCT	6	15	0.90
Plant Hire	monthly	$2^1/_6$	3	0.065
				3.76

Say $3^3/_4$ weeks of a typical $4^1/_3$ week month, hence weighted average delay = 0.87 months.

*Direct Labour:
Assume a productive bonus scheme is in operation and that pay = $^2/_3$ basic plus $^1/_3$ production bonus; bonus payments lagging behind basic by one week.

basic pay = $^1/_2$ week delay × $^2/_3$ = $^2/_6$
bonus = $^3/_2$ week delay × $^1/_3$ = $^3/_6$
} $^5/_6$

†Salaried Labour etc:
Assume this includes other associated overhead payments.

Note: A payments delay analysis may be carried out quite accurately for a project once the mix of resources and associated credit facilities is known and may be adjusted to reflect the position at various stages in the project.

In the analysis used in this paper a 'lead-in' delay has been incorporated as below, to reflect the delay build-up. In reality this will vary for each project considered and will be dependant upon the method of working adopted.

Month	Delay applied to payment (months)
1	0.087
2	0.254
3	0.487
4 onwards	0.870

(This is illustrated in the cost S-curves as Figure 1B.)

The technique of price manipulation of individual items within an overall contract price, known as front-end-loading, is a quite legitimate exercise despite its being possibly at variance with the pricing dictates of the standard method of measurement. The application of the technique is subject to detection during the private quantity surveyor's checking of the priced bills. It is often difficult to advise an employer to reject the lowest tender and accept a higher one on the basis of imbalances of the prices of individual items comprising the lowest tender. However, the increasing consciousness of all parties of the time-value of money should make such rejection more likely.

Inflation constitutes a further problem expecially for fixed price contracts (or fixed price elements of fluctuations contracts). Where the advocated principles of good estimating, tendering and contracting have not been followed, the problem is exacerbated. Here inflation will increase the costs to the contractor, the fixed price contract terms limit the scope for direct recovery from the client. Pressure builds up, however, to employ 'loophole engineering practice', and few contracts are so well documented that some opportunities for recovering costs will not occur.

One further practice which should be noted (although the frequency of its occurrence is impossible to determine) is that of enhanced valuation. Whilst no interim valuation can be absolutely precise it will be fairly accurate in most cases. Early enhanced valuations will normally lead to later under valuations as the total is unaffected. The effects of this practice will be similar to front-end-loading.

Results of the Analysis

The most notable result was the impact of the application of payments delay upon the finance requirements.

In all profit-making scenarios the application of the weighted average delay to payments brought forward, very markedly, the break-even point for the net cash flow curve and, where the mark-up was 15% and inflation 6% p.a. significantly brought forward the point at which the project became entirely self-financing (especially for the front-end-loaded case).

The maximum long-term finance requirements were significantly reduced by the application of payments delay, as were the maximum short-term finance requirements for 15% mark-up but less significantly for 4% mark-up.

In all instances considered, the application of payments delay greatly reduced the amount of long-term finance required both in average terms and in pound-month terms (a pound-month is one pound required for one month and so may be used as a surrogate for the cost of capital). Similar effects were also evident in the consideration of short-term finance requirements. The reduction in short-term finance requirements for the 4% mark-up cases was only slight.

The application of front-end-loading of the stipulated mark-up increased the maximum short-term finance requirements for the normal pricing cases but reduced the requirements for the payments delay cases. The effect of applying front-end-loading upon maximum long-term finance was to reduce the requirements.

Considering the pound-month measure, the application of front-end-loading reduced both long-term finance and short-term finance requirements.

The effects of increasing inflation (linearly, at monthly intervals) from 6–18% p.a. had the most predictable effects viz: a) the final profit was proportionately reduced; b) the maximum finance requirements were increased; c) the break-even cash flow points were delayed. Perhaps most significant is the overall effect of this cost increase – the graph is rotated in a clockwise direction about the origin.

In considering the profit produced by each scenario it has been assumed that at each profit reporting period (monthly) the full costs incurred to that date (or for that period) have been taken into account. Figures 2 and 3, therefore, represent the profit of each project scenario as it should be reported ideally to management and thus correspond to the usual cost/value reconciliation. Neither retention nor payments delay should make any impact upon the profit figure reported. Any over-valuations should also have been adjusted in order that a true picture is obtained.

The cumulative profit (Fig 3) may be used for project control. The curve appropriate to the project will require updating periodically to allow for variations, etc. An 'envelope of permissible deviation' may also be constructed around the 'control' curve.

In this analysis three curves are associated with each 'control' (b, c, d with a; f, g, h with e). Those associated with 'control a' are examined below.

Curve (b) may be considered in the same light as (a), provided the pricing method used is known to the management parties concerned; no problems should arise if such a profit pattern is achieved. However, if the pricing method is kept secret, obvious problems soon arise. A very optimistic management might not investigate why very high profits were obtained early in the project, predict a final profit on the basis of the first few months' profit levels (thereby vastly over-anticipating the final profit) and possibly over-commit the firm. Only after month 6 would such predictions be reduced.

Curve (c) is at a lower profit level due to rising inflation. Management action, to attempt to restore the 'control' position for this firm price contract is well known.

Curve (d) is the most extreme, combining the problems of (b) and (c) above. As a management dilemma such a situation is likely to be a greater problem than the mere sum of its components. However, the cash flow pattern may be regarded as a definite advantage.

Conclusions

1. The most significant cash flow advantages appear to be obtained by the application of weighted average payments delay, illustrating the advantages of good credit control.
2. The application of weighted average payments delay in the analyses reduced, particularly, the long-term finance requirements, reinforcing the advantage of good credit control.
3. The use of pricing manipulations, such as front-end-loading, and valuation en-

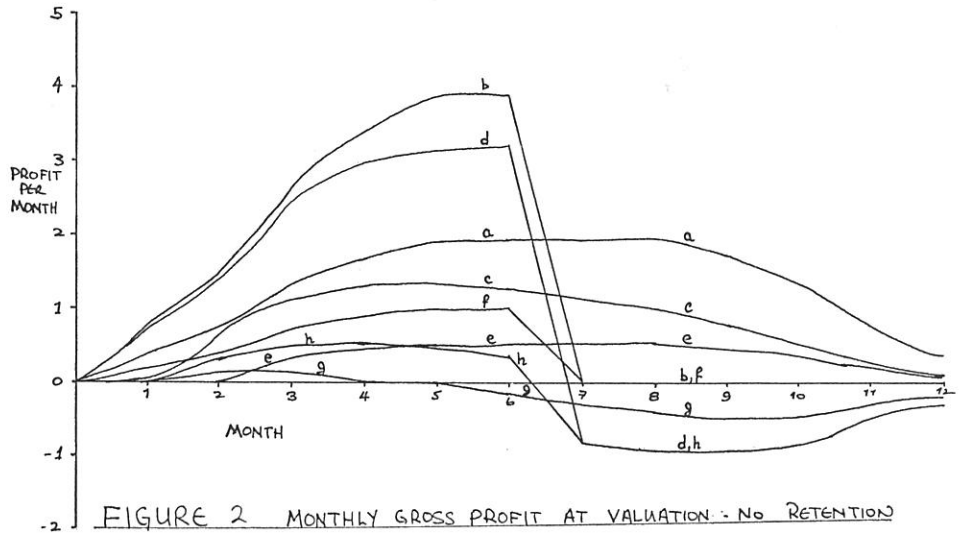

FIGURE 2 MONTHLY GROSS PROFIT AT VALUATION - NO RETENTION

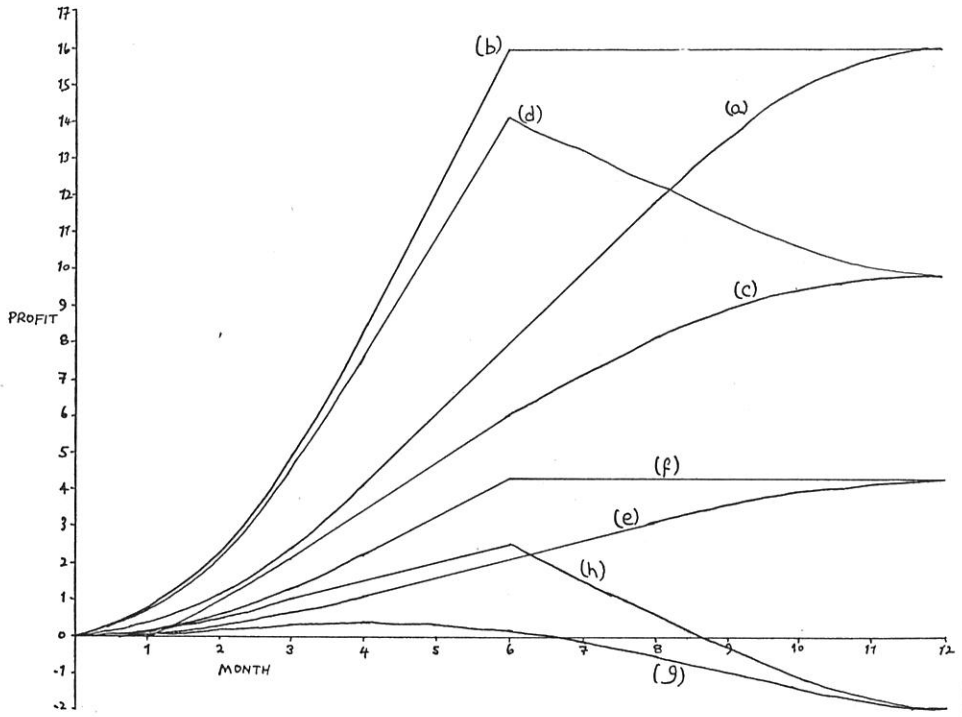

FIGURE 3.

Key to Figures 2 and 3

(a) Mark-up 15%;	Inflation 6% p.a.;	Normal
(b) Mark-up 15%;	Inflation 6% p.a.;	F.E.L.
(c) Mark-up 15%;	Inflation 6–18% p.a.;	Normal
(d) Mark-up 15%;	Inflation 6–18% p.a.;	F.E.L.
(e) Mark-up 4%;	Inflation 6% p.a.;	Normal
(f) Mark-up 4%;	Inflation 6% p.a.;	F.E.L.
(g) Mark-up 4%;	Inflation 6–18% p.a.;	Normal
(h) Mark-up 4%;	Inflation 6–18% p.a.;	F.E.L.

hancements are of only secondary importance to a contractor's cash flow and finance requirements.

4. Finance costs are usually treated as part of overheads. Activities which benefit a project's cash flow situation should lead to a profit increase. This accrues to the firm by reducing the cost of finance and may become manifest only by a reducing level of overheads.
5. The requirements of accurate profitability reporting must be publicised so that control can be correctly implemented.

   The practice of not declaring income until it is assured thus keeping hidden reserves against reported production losses is to be avoided.
6. Inadequate allowance for inflation in project estimates has the following major effects:

   (a) the cost of the project increases and the profit is consequently reduced,

   (b) the amounts of finance required by the contractor to execute the project are increased,

   (c) the cost of finance is increased.

   Thus, as finance costs are usually treated as part of overheads, inflation will cause a negative overhead variance.

There are many problems associated with forecasting costs even one year ahead. Trend anaylsis is a useful technique but an element of gamble is inevitably involved.

It may be worthwhile obtaining materials early if the storage costs are less than anticipated price increases for those materials.

The necessity to control credit and cash flow is applicable not only in recession periods as a set of measures to facilitate survival, it is an essential for all times. As there is not a steady, foreseeable workload for the industry over the long period, the demand is of a rather cyclical nature.

Thus it is necessary to consider average returns over a period of time, requiring high earnings in buoyant periods to compensate for low returns (if any) during recessions. Merely because percentage margins are higher does not mean that it is immaterial if the profit margin is reduced by a few percent because life may be temporarily easier by following that path. Policies should be consistent, if a claim is legitimate in a recession, it is equally legitimate during a boom. It is suggested that inconsistent policies, varied to suit prevailing economic conditions, serve little purpose and promote distrust and argument.

Although this paper has examined cash flow from a contractor's point of view, it is not unreasonable to suggest that more favourable cash flows for the contractor could ultimately lead to a more efficient economy. This would result from contractors requiring less capital to execute their workload which would then be cheaper, thereby reducing clients' capital requirements and costs.

More cynically, the result might be just that contractors' profit margins would be increased. But is this totally unreasonable? Would many wish to take on the risks of building contracting with a prospective profit margin of less than one quarter of bank base rates? Even in short lived booms, contractors' profits on construction work are seldom spectacular!

This article is an abbreviated form of Working Paper No. 21 which can be obtained from the Department of Building Technology, Brunel University.