# A Tutorial on the McKinsey Model for Valuation of Companies

L. Peter Jennergren *

Fourth revision, August 26, 2002

*SSE/EFI Working Paper Series in Business Administration No. 1998:1*

**Abstract**

All steps of the McKinsey model are outlined. Essential steps are: calculation of free cash flow, forecasting of future accounting data (profit and loss accounts and balance sheets), and discounting of free cash flow. There is particular emphasis on forecasting those balance sheet items which relate to Property, Plant, and Equipment. There is an exemplifying valuation included (of a company called McKay), as an illustration.

Key words: Valuation, free cash flow, discounting, accounting data
JEL classification: G31, M41, C60

*Stockholm School of Economics, Box 6501, S - 11383 Stockholm, Sweden. The author is indebted to Joakim Levin, Per Olsson, Kenth Skogsvik, and Tomas Hjelström for discussions and comments. Minor corrections made September 29, 2004, and February 9, 2005.

# 1 Introduction

This tutorial explains all the steps of the McKinsey valuation model, also referred to as the discounted cash flow model and described in Tom Copeland, Tim Koller, and Jack Murrin: *Valuation: Measuring and Managing the Value of Companies* (Wiley, New York; 1st ed. 1990, 2nd ed. 1994, 3rd ed. 2000). The purpose is to enable the reader to set up a complete valuation model of his/her own, at least for a company with a simple structure (e. g., a company that does not consist of several business units and is not involved in extensive foreign operations). The discussion proceeds by means of an extended valuation example. The company that is subject to the valuation exercise is the McKay company.

The McKay example in this tutorial is somewhat similar to the Preston example (concerning a trucking company) in Copeland et al. 1990, Copeland et al. 1994. However, certain simplifications have been made, for easier understanding of the model. In particular, the capital structure of McKay is composed only of equity and debt (i. e., no convertible bonds, etc.). The purpose of the McKay example is merely to present all essential aspects of the McKinsey model as simply as possible. Some of the historical income statement and balance sheet data have been taken from the Preston example. However, the forecasted income statements and balance sheets are totally different from Preston's. All monetary units are unspecified in this tutorial (in the Preston example in Copeland et al. 1990, Copeland et al. 1994, they are millions of US dollars).

This tutorial is intended as a guided tour through one particular implementation of the McKinsey model and should therefore be viewed only as exemplifying: This is one way to set up a valuation model. Some modelling choices that have been made will be pointed out later on. However, it should be noted right away that the specification given below of net Property, Plant, and Equipment (PPE) as driven by revenues is actually taken from Copeland et al. 2000. The previous editions of this book contain two alternative model specifications relating to investment in PPE (cf. Section 15 below; cf. also Levin and Olsson 1995).

In one respect, this tutorial is an extension of Copeland et al. 2000: It contains a more detailed discussion of capital expenditures, i. e., the mechanism whereby cash is absorbed by investments in PPE. This mechanism centers on two particular forecast assumptions, [this year's net PPE/revenues] and [depreciation/last year's net PPE].[1] It is explained below how those assumptions can be specified at least somewhat consistently. On a related note, the treatment of deferred income taxes is somewhat different, and also more detailed, compared to Copeland et al. 2000. In particular, deferred income taxes are related to a forecast ratio [timing differences/this year's net PPE], and it is suggested how to set that ratio.

[1]Square brackets are used to indicate specific ratios that appear in tables in the spreadsheet file.

There is also another extension in this tutorial: An alternative valuation model is included, too, the abnormal earnings model. That is, McKay is valued through that model as well.

The McKay valuation is set up as a spreadsheet file in Excel named MCK_1.XLS. That file is an integral part of this tutorial. The model consists of the following parts (as can be seen by loading the file):

Table 1. Historical income statements,
Table 2. Historical balance sheets,
Table 3. Historical free cash flow,
Table 4. Historical ratios for forecast assumptions,
Table 5. Forecasted income statements,
Table 6. Forecasted balance sheets,
Table 7. Forecasted free cash flow,
Table 8. Forecast assumptions,
Value calculations.

Tables in the spreadsheet file and in the file printout that is included in this tutorial are hence indicated by numerals, like Table 1. Tables in the tutorial text are indicated by capital letters, like Table A.

The outline of this tutorial is as follows: Section 2 gives an overview of essential model features. Section 3 summarizes the calculation of free cash flow. Section 4 is an introduction to forecasting financial statements and also discusses forecast assumptions relating to operations and working capital. Sections 5, 6, and 7 deal with the specification of the forecast ratios [this year's net PPE/revenues], [depreciation/last year's net PPE], and [retirements/last year's net PPE]. Section 8 considers forecast assumptions about taxes. Further forecast assumptions, relating to discount rates and financing, are discussed in Section 9. Section 10 outlines the construction of forecasted financial statements and free cash flow, given that all forecast assumptions have been fixed. Section 11 outlines a slightly different version of the McKay example, with another system for accounting for deferred income taxes.[2] The discounting procedure is explained in Section 12. Section 13 gives results from a sensitivity analysis, i. e., computed values of McKay's equity when certain forecast assumptions are revised. Section 14 discusses the abnormal earnings model and indicates how McKay's equity can be valued by that model. Section 15 discusses two further discounted cash flow model versions, one of which may in a certain sense be considered "exact". The purpose is to get a feeling for the goodness of valuations derived

[2] This version of the McKay example is contained in the Excel file MCK_1B.XLS. A printout from that file is also included in this tutorial. The two versions of the McKay example are equivalent as regards cash flow and resulting value. In other words, it is only the procedure for computing free cash flow that differs (slightly) between them.

by means of the McKinsey model, in particular the sensitivity to changes in certain model parameters. Section 16 contains concluding remarks. There are two appendices. Appendix 1 discusses how a data base from Statistics Sweden can be used as an aid in specifying parameters related to the forecast ratios [this year's net PPE/revenues], [depreciation/last year's net PPE] and [retirements/last year's net PPE]. Appendix 2 is a note on leasing. The point is that payments associated with leases can be viewed as pertaining either to the firm's operations, or to its financing. If one is consistent, both views lead to the same valuation result. A similar remark also applies to payments associated with pensions.

## 2 Model Overview

Essential features of the McKinsey model are the following:

1. The model uses published accounting data as input. Historical income statements and balance sheets are used to derive certain critical financial ratios. Those historical ratios are used as a starting point in making predictions for the same ratios in future years.

2. The object of the McKinsey model is to value the *equity* of a going concern. Even so, the *asset side* of the balance sheet is initially valued. The value of the interest-bearing debt is then subtracted to get the value of the equity. Interest-bearing debt does not include deferred income taxes and trade credit (accounts payable and other current liabilities). Credit in the form of accounts payable is paid for not in interest but in higher operating expenses (i. e., higher purchase prices of raw materials) and is therefore part of operations rather than financing. Deferred income taxes are viewed as part of equity; cf. Sections 9 and 10. It may seem like an indirect approach to value the assets and deduct interest-bearing debt to arrive at the equity (i. e., it may seem more straight-forward to value the equity directly, by discounting future expected dividends). However, this indirect approach is the recommended one, since it leads to greater clarity and fewer errors in the valuation process (cf. Copeland et al. 2000, pp. 150-152).

3. The value of the asset side is the value of operations plus *excess marketable securities*. The latter can usually be valued using book values or published market values. Excess marketable securities include cash that is not necessary for operations. For valuation purposes, the cash account may hence have to be divided into two parts, operating cash (which is used for facilitating transactions relating to actual operations), and excess cash. (In the case of McKay, excess marketable securities have been netted against interest-bearing debt at the date of valuation. Hence there are actually no excess marketable securities in the McKay valuation. This is one of the modelling choices that were alluded to in the introduction.)

4. The operations of the firm, i. e., the total asset side minus excess marketable secu-

rities, are valued by the WACC method. In other words, free cash flow from operations is discounted to a present value using the WACC. There is then a simultaneity problem (actually quite trivial) concerning the WACC. More precisely, the debt and equity values enter into the WACC weights. However, equity value is what the model aims to determine.

5. The asset side valuation is done in two parts: Free cash flow from operations is forecasted for a number of individual years in the *explicit forecast period*. After that, there is a continuing value derived from free cash flow in the first year of the *post-horizon period* (and hence individual yearly forecasts must be made for each year in the explicit forecast period and for one further year, the first one immediately following the explicit forecast period). The explicit forecast period should consist of at least 7 - 10 years (cf. Copeland et al. 2000, p. 234). The explicit forecast period can be thought of as a transient phase during a turn-around or after a take-over. The post-horizon period, on the other hand, is characterized by steady-state development. This means that the explicit forecast period should as a minimal requirement be sufficiently long to capture transitory effects, e. g., during a turn-around operation.

6. For any future year, free cash flow from operations is calculated from forecasted income statements and balance sheets. This means that free cash flow is derived from a consistent scenario, defined by forecasted financial statements. This is probably the main strength of the McKinsey model, since it is difficult to make reasonable forecasts of free cash flow in a direct fashion. Financial statements are forecasted in nominal terms (which implies that nominal free cash flow is discounted using a nominal discount rate).

7. Continuing (post-horizon) value is computed through an infinite discounting formula. In this tutorial, the Gordon formula is used (cf. Brealey and Myers 2002, pp. 38 and 64-65). In other words, free cash flow in the post-horizon period increases by some constant percentage from year to year, hence satisfying a necessary condition for infinite discounting. (The Gordon formula is another one of the modelling choices made in this tutorial.)

As can be inferred from this list of features, and as will be explained below, the McKinsey model combines three rather different tasks: The first one is the production of forecasted financial statements. This is not trivial. In particular, it involves issues relating to capital expenditures that are fairly complex. (The abnormal earnings model uses forecasted financial statements, just like the McKinsey model, so the first task is actually the same for that model as well).

The second task is deriving free cash flow from operations from financial statements. At least in principle, this is rather trivial. In fairness, it is not always easy to calculate free cash flow from complicated historical income statements and balance sheets. However, all financial statements in this tutorial are very simple (and there is, in any case, no reason to *forecast* accounting complexities if the purpose is one of valuation). The third task is discounting forecasted free cash flow to a present value. While not exactly trivial, this task is nevertheless one that has been discussed extensively in the corporate finance literature, so there is guidance available. This tutorial will explain the mechanics of discounting in the McKinsey model. However, issues relating to how the relevant discount rates are determined will largely be brushed aside. Instead, the reader is referred to standard text books (for instance, Brealey and Myers 2002, chapters 9, 17, and 19).

# 3 Historical Financial Statements and the Calculation of Free Cash Flow

The valuation of McKay is as of Jan. 1 year 1. Historical input data are the income statements and balance sheets for the years −6 to 0, Tables 1 and 2. Table 1 also includes statements of retained earnings. It may be noted in Table 1 that operating expenses do not include depreciation (i. e., operating expenses are cash costs). At the bottom of Table 2, there are a couple of financial ratio calculations based on historical data for the given years. *Short-term debt* in the balance sheets (Table 2) is that portion of last year's long-term debt which matures within a year. It is clear from Tables 1 and 2 that McKay's financial statements are very simple, and consequently the forecasted statements will also have a simple structure. As already mentioned earlier, McKay has no excess marketable securities in the last historical balance sheet, i. e., at the date of valuation.

From the data in Tables 1 and 2, historical free cash flow for the years −5 to 0 is computed in Table 3. Each annual free cash flow computation involves *two* balance sheets, that of the present year and the previous one, so no free cash flow can be obtained for year −6. Essentially the same operations are used to forecast free cash flow for year 1 and later years (in Table 7). The free cash flow calculations assume that the *clean surplus relationship* holds. This implies that the change in book equity (including retained earnings) equals net income minus net dividends (the latter could be negative, if there is an issue of common equity). The clean surplus relationship does not hold, if PPE is written down (or up) directly against common equity (for instance). Such accounting operations may complicate the calculation of free cash flow from historical financial statements (and if so, that calculation may not be trivial). However, there is no reason to *forecast* deviations from the clean surplus relationship in a valuation situation.

EBIT in Table 3 means Earnings Before Interest and Taxes. NOPLAT means Net Operating Profits Less Adjusted Taxes. *Taxes on EBIT* consist of calculated taxes according to the income statement (from Table 1) *plus* [this year's tax rate]×(interest expense) *minus* [this year's tax rate]×(interest income). Interest income and interest expense are taken from Table 1. The tax rate is given in Table 4. Calculated taxes according to the income statement reflect depreciation of PPE over the economic life. *Change in deferred* *income taxes* is this year's deferred income taxes *minus* last year's deferred income taxes. In the McKay valuation example, it is assumed that deferred income taxes come about for one reason only, *timing differences* in depreciation of PPE. That is, fiscal depreciation takes place over a period shorter than the economic life.

*Working capital* is defined net. Hence, working capital consists of the following balance sheet items: Operating cash *plus* trade receivables *plus* other receivables *plus* inventories *plus* prepaid expenses *minus* accounts payable *minus* other current liabilities. Accounts payable and other current liabilities are apparently considered to be part of the operations of the firm, not part of the financing (they are not interest-bearing debt items). *Change in working capital* in Table 3 is hence this year's working capital *minus* last year's working capital. *Capital expenditures* are this year's net PPE *minus* last year's net PPE *plus* this year's depreciation. Depreciation is taken from Table 1, net PPE from Table 2. It should be emphasized that depreciation in Table 1 (and forecasted depreciation in Table 5) is according to plan, over the economic life of the PPE.

Free cash flow in Table 3 is hence cash generated by the operations of the firm, after paying taxes on operations only, and after expenditures for additional working capital and after capital expenditures. ("Additional working capital" could of course be negative. If so, free cash flow is *generated* rather than *absorbed* by working capital.) Hence, free cash flow represents cash that is available for distribution to the holders of debt and equity in the firm, and for investment in additional excess marketable securities. Stated somewhat differently, free cash flow is equal to *financial cash flow*, which is the utilization of free cash flow for financial purposes. Table 3 also includes a break-down of financial cash flow. By definition, free cash flow must be exactly equal to financial cash flow.

As suggested in the introduction (Section 1), certain payments may be classified as pertaining either to free cash flow (from operations), or to financial cash flow. In other words, those payments may be thought of as belonging either to the operations or the financing of the firm. This holds, in particular, for payments associated with capital leases. If one is consistent, the resulting valuation should of course not depend on that classification. This issue is further discussed in Appendix 2.

We now return briefly to the financial ratios at the end of Table 2. *Invested capital* is equal to working capital *plus* net PPE. Debt at the end of Table 2 in the ratio [debt/invested capital] is interest-bearing (short-term and long-term). The financial ratio [NOPLAT/invested capital] is also referred to as ROIC (Return on Invested Capital). It is a better analytical tool for understanding the company's performance than other return measures such as return on equity or return on assets, according to Copeland et al. (2000, pp. 165-166). Invested capital in the ratio [NOPLAT/invested capital] is the average of last year's and this year's. It is seen that McKay has on average provided a fairly modest rate of return in recent years. It can also be seen from Table 3 that the free cash flow has been negative, and that the company has handled this situation by increasing its debt. It is also evident from the bottom of Table 2 that the ratio of interest-bearing debt to invested capital has increased substantially from year −6 to year 0.

Table 4 contains a set of historical financial ratios. Those ratios are important, since forecasts of the same ratios will be used to produce forecasted income statements and balance sheets. Most of the items in Table 4 are self-explanatory, but a few observations are called for. Net PPE (which is taken from Table 2) enters into four ratios. In two of those cases, [depreciation/net PPE] and [retirements/net PPE], the net PPE in question is last year's. In the other two cases, [net PPE/revenues] and [timing differences/net PPE], the net PPE in question is this year's. *Retirements* are defined as depreciation *minus* change in accumulated depreciation between this year and last year (accumulated depreciation is taken from Table 2). This must hold, since last year's accumulated depreciation *plus* this year's depreciation *minus* this year's retirements equals this year's accumulated depreciation.

The *timing differences* for a given year are measured between accumulated fiscal depreciation of PPE and accumulated depreciation according to PPE economic life. For a given piece of PPE that is about to be retired, accumulated fiscal depreciation and accumulated depreciation according to economic life are both equal to the original acquisition value. Consequently, non-zero timing differences are related to non-retired PPE only. The ratio [timing differences/net PPE] in Table 4 has been calculated by first dividing the deferred income taxes for a given year by the same year's corporate tax rate (also given in Table 4). This gives that year's timing differences. After that, there is a second division by that year's net PPE.

# 4 Forecast Assumptions Relating to Operations and Working Capital

Having recorded the historical performance of McKay in Tables 1 - 4, we now turn to the task of forecasting free cash flow for years 1 and later. Individual free cash flow forecasts are produced for each year 1 to 12. The free cash flow amounts for years 1 to 11 are discounted individually to a present value. The free cash flow for year 12 and all later years is discounted through the Gordon formula, with the free cash flow in year 12 as a starting value. Years 1 to 11 are therefore the explicit forecast period, and year 12 and all later years the post-horizon period.

Tables 5 - 8 have the same format as Tables 1 - 4. In fact, Table 5 may be seen as a continuation of Table 1, Table 6 as a continuation of Table 2, and so on. We start the forecasting job by setting up Table 8, the forecast assumptions. Using assumptions (financial ratios and others) in that table, and using a couple of further direct forecasts of individual items, we can set up the forecasted income statements, Table 5, and the forecasted balance sheets, Table 6. From Tables 5 and 6, we can then in Table 7 derive the forecasted free cash flow (just like we derived the historical free cash flow in Table 3, using information in Tables 1 and 2).

Consider now the individual items in Table 8. It should be noted in Table 8 that all items are the same for year 12, the first year of the post-horizon period, as for year 11, the last year of the explicit forecast period. Since the first year in the post-horizon period is representative of all subsequent post-horizon years, all items are the same for every post-horizon year as for the last year of the explicit forecast period. This is actually an important condition (cf. Levin and Olsson 1995, p. 38): If that condition holds, then free cash flow increases by the same percentage (the nominal revenue growth rate for year 12 in Table 8, cell T137) between all successive years in the post-horizon period. This means that a necessary condition for discounting by means of the Gordon formula in the post-horizon period is satisfied.

The *revenue growth* in each future year is seen to be a combination of inflation and real growth. Actually, in years 10 and 11 there is no real growth, and the same assumption holds for all later years as well (in the application of the Gordon formula). The underlying assumption in Table 8 is apparently that real operations will initially expand but will eventually (in year 10) settle down to a steady state with no further real growth. Inflation, on the other hand, is assumed to be 3% in all coming years (including after year 11). The ratio of *operating expenses to revenues* is assumed to improve immediately, e. g., as a consequence of a determined turn-around effort. Apparently, it is set to 90% year 1 and all later years. To avoid misunderstandings, this forecast assumption (and the other ones displayed in Table 8) are not necessarily intended to be the most realistic ones that can be imagined. The purpose is merely to demonstrate the mechanics of the McKinsey model for one particular scenario. A table in Levin and Olsson 1995 (p. 124; based on accounting data from Statistics Sweden) contains information about typical values of the ratio between operating expenses and revenues in various Swedish industries (cf. also Appendix 1 for a further discussion of the Statistics Sweden data base).

A number of items in the forecasted income statements and balance sheets are directly driven by revenues. That is, those items are forecasted as percentages of revenues. In particular, this holds for the *working capital* items. It is thus assumed that as revenues increase, the required amounts of working capital of different categories increase correspondingly. It is not important whether revenues increase due to inflation or real growth, or a combination of both. Working capital turns over very quickly, and therefore it is a reasonable assumption that the working capital items are simply proportional to revenues. The ratios between the different categories of working capital and revenues for future years in Table 8 have been set equal to the average values of the corresponding historical percentages in Table 4. Again, this is only for illustrative purposes. Another table in Levin and Olsson 1995 (p. 125), again based on data from Statistics Sweden, reports average values of the ratio between (aggregate) working capital and revenues in different Swedish industries.

# 5 Forecast Assumptions Relating to Property, Plant, and Equipment

The forecast assumptions relating to PPE will be considered next (this section and the following two). The equations that determine capital expenditures may be stated as follows (subscripts denote years):

$$\begin{aligned}
&(\text{capital expenditures})_t = (\text{net PPE})_t - (\text{net PPE})_{t-1} + \text{depreciation}_t,\\
&(\text{net PPE})_t = \text{revenues}_t \times [\text{this year's net PPE/revenues}],\\
&\text{depreciation}_t = (\text{net PPE})_{t-1} \times [\text{depreciation/last year's net PPE}].
\end{aligned}$$

To this set of equations, we may add three more that are actually not necessary for the model:

$$\begin{aligned}
&\text{retirements}_t = (\text{net PPE})_{t-1} \times [\text{retirements/last year's net PPE}],\\
&(\text{accumulated depreciation})_t\\
&\quad = (\text{accumulated depreciation})_{t-1} + \text{depreciation}_t - \text{retirements}_t,\\
&(\text{gross PPE})_t = (\text{net PPE})_t + (\text{accumulated depreciation})_t.
\end{aligned}$$

In particular, this second set of three equations is needed only if one wants to produce forecasted balance sheets showing how net PPE is related to gross PPE minus accumulated depreciation. It should be noted that such detail is not necessary, since the first set of three equations suffices for determining net PPE, depreciation, and consequently also capital expenditures.[3]

It is clear from the first three equations that forecasts have to be made for two particular ratios, [this year's net PPE/revenues] and [depreciation/last year's net PPE]. Setting those ratios in a consistent fashion involves somewhat technical considerations. In this section and the following one, one way of proceeding, consistent with the idea of the company developing in a *steady-state* fashion in the post-horizon period, will be outlined.

To begin with, the idea of the company developing in a steady-state fashion has to be made more precise. As indicated in Section 4, the forecast assumptions should be

[3]If the historical financial statements do not show gross PPE and accumulated depreciation, only net PPE, then it seems pointless to try to include these items in the forecasted financial statements. If so, the second set of three equations is deleted. In the McKay case, the historical statements do indicate gross PPE and accumulated depreciation. For that (aesthetic) reason, those items will also be included in the forecasted statements.

specified in such a manner that nominal free cash flow increases by a constant percentage every year in the post-horizon period. This is a necessary condition for infinite discounting by the Gordon formula. But if so, capital expenditures must also increase by the same constant percentage in every post-horizon year. For this condition on capital expenditures to hold, there must be an *even age distribution* of nominal acquisition values of successive PPE cohorts. More precisely, it must hold that the acquisition value of each PPE cohort develops in line with the assumed constant growth percentage that is applicable to the post-horizon period. As also mentioned in Section 4, that constant percentage is the same as the assumed nominal revenue growth in the post-horizon period, 3% in the McKay example.

The general idea is now to set steady-state values of the two ratios [this year's net PPE/revenues] and [depreciation/last year's net PPE] for *the last year of the explicit forecast period* (year 11 in the McKay example). Those steady-state values will then also hold for every year in the post-horizon period (since all forecast assumptions have to be the same in the first year of the post-horizon period as in the last year of the explicit forecast period, as already explained in Section 4).

During the preceding years of the explicit forecast period, steady-state values of [this year's net PPE/revenues] and [depreciation/last year's net PPE] are not assumed. Values for these two ratios in the preceding explicit forecast period years are fixed in the following heuristic fashion in the McKay example: For the first year of the explicit forecast period, they are set as averages of the corresponding values for the historical years.[4] Values for intermediate (between the first and last) years in the explicit forecast period are then determined by linear interpolation.

# 6 The Ratios [this year's net PPE/revenues] and [depreciation/last year's net PPE]

It is helpful at this point to proceed more formally and introduce the following notation:

$g$ real growth rate in the last year of the explicit forecast period and in the post-horizon period,

$i$ inflation rate in the last year of the explicit forecast period and in the

[4]The value for the last year of the explicit forecast period of [retirements/last year's net PPE] is also set as a steady-state value. For the first year of the explicit forecast period, that ratio is set equal to the corresponding value for the last historical year. An average of corresponding values for all historical years is not used in this case, since [retirements/last year's net PPE] appears to have been unstable during years $-5$ to 0. The negative value of that ratio in year -2 could have come about through purchases of used (second-hand) PPE. It is again noted that the ratio [retirements/last year's net PPE] is actually not necessary for the valuation model.

post-horizon period,

$c$ nominal (composite) growth rate $= (1+g)(1+i) - 1$,

$n$ economic life of PPE (assumed to be integer),

$q$ life of PPE for fiscal depreciation; see Section 8 (assumed to be integer),

$K$ required *real gross* PPE divided by (real) revenues in the last year of the explicit forecast period and in the post-horizon period,

$M$ ratio between this year's *nominal gross* PPE and (nominal) revenues in the last year of the explicit forecast period and in the post-horizon period,

$F_g$ backwards summation factor expressing *real gross* PPE,

$F_c$ backwards summation factor expressing *nominal gross* PPE,

$a$ acquisition value of last PPE cohort (nominal *and* real; real = nominal *now*),

$H$ steady-state accumulated depreciation as a fraction of gross PPE,

$J$ factor expressing timing differences; see Section 8.

It is assumed in this tutorial that $g$ and $i$ are non-negative. To assume negative inflation over an infinite number of years is simply not credible. Negative real growth of the firm over an infinite number of years is also not realistic in connection with the McKinsey model. If such a situation were really foreseen, then a *break-up valuation* would be more relevant than a going concern valuation (as implied by the McKinsey model). Apparently, in the McKay example $g = 0.00$, $i = 0.03$, and consequently $c = 0.03$ in the last year of the explicit forecast period and from then on.

The main task in this section is to set the steady-state value of the ratio [this year's net PPE/revenues]. As before, by steady state is meant that the acquisition values of successive PPE cohorts increase by $c$, the nominal growth rate of revenues. Also as noted before, steady-state values of all forecast ratios must be attained already in the last year of the explicit forecast period.

At this point, there is a need for some model of the relationship between revenues and PPE, that is, a model of the firm's production. It is assumed here that revenues are related to *real gross* PPE through a capital intensity factor $K$. In other words, in the last year of the explicit forecast period and from then on, real gross PPE must be equal to revenues multiplied by $K$. *Real* means expressed in the value of money of the current year in question. Real revenues are equal to nominal revenues for the current year. Real gross PPE means nominal gross PPE adjusted for inflation. Such an adjustment implies revaluing each PPE cohort, through multiplication by a factor that expresses accumulated inflation since that cohort was acquired. By relating revenues to *real* gross PPE, one eliminates effects due to inflation. The assumption that revenues are related to *gross* rather than net PPE implies that each piece of PPE is 100% productive until the end of its economic life. At that point in time, it suddenly ceases to function and is retired. This seems like a somewhat more intuitive hypothesis than the alternative, relating revenues to *net* PPE, since that would mean that the productivity of each piece of PPE is proportional to its remaining economic life.

It is the steady-state value of the ratio [this year's *net* PPE/revenues] that is the object here, but initially $M$ will be derived, that is, the ratio between this year's nominal *gross* PPE and (nominal) revenues in the last year of the explicit forecast period and in the post-horizon period. After that, $M$ is multiplied by a factor $(1 - H)$ expressing steady-state *net* PPE as a fraction of steady-state gross PPE, hence providing steady-state [this year's *net* PPE/revenues].

Suppose now that $a$ is the acquisition value of the last PPE cohort, which has just been purchased at the end of the current year. That acquisition value is the *real* one, expressed in current monetary units. Given the steady-state assumption, which implies that the acquisition values of previous cohorts have increased in *real* terms by the real growth rate $g$ from year to year, the *real* value of gross PPE (in current monetary units and at the end of the current year) is hence $F_g \cdot a$, where[5]

$$F_g = \sum_{v=0}^{n-1} \left(\frac{1}{1+g}\right)^v = \frac{1 + g - (1+g)^{-(n-1)}}{g} \text{ if } g > 0; \qquad F_g = n \text{ if } g = 0.$$

The physical requirement for gross PPE then implies that

$$F_g \cdot a = K \cdot \text{revenues}.$$

Similarly, the *nominal* value of gross PPE at the end of the current year, under the steady-state assumption, is $F_c \cdot a$, where

$$F_c = \sum_{v=0}^{n-1} \left(\frac{1}{1+c}\right)^v = \frac{1 + c - (1+c)^{-(n-1)}}{c} \text{ if } c > 0; \qquad F_c = n \text{ if } c = 0.$$

Consequently,

$$F_c \cdot a = M \cdot \text{revenues}.$$

The formulas for $F_g$ and $F_c$ are contained in cells S153 and S154 in Table 8. It follows that (cell S156)

$$M = (F_c/F_g) \cdot K.$$

[5]The formulas for $F_g$ and $F_c$ use the summation

$$\sum_{v=0}^{\kappa} x^v = \frac{1 - x^{\kappa+1}}{1-x} \qquad (x \neq 1).$$

The following summation formula is also used below

$$\sum_{v=0}^{\kappa} x^v v = \frac{d}{dx}\left(\sum_{v=0}^{\kappa} x^v\right) \cdot x = \frac{-(\kappa+1)x^\kappa(1-x) + (1 - x^{\kappa+1})}{(1-x)^2} \cdot x \qquad (x \neq 1). \tag{1}$$

Accumulated depreciation as a fraction of gross PPE in a steady state, $H$, can be written as (using (1) with $\kappa = n-1$; cf. also Levin and Olsson 1995, pp. 37 and 51):

$$H = \frac{\sum_{v=0}^{n-1}\left[\left(\frac{1}{1+c}\right)^{v}\cdot\frac{v}{n}\right]}{F_c} = \frac{\frac{-n(1+c)^{-(n-1)}\left(1-(1+c)^{-1}\right)+\left(1-(1+c)^{-n}\right)}{\left(1-(1+c)^{-1}\right)^{2}}\cdot\frac{1}{1+c}\cdot\frac{1}{n}}{F_c} =$$

$$\frac{\frac{1+c-(nc+1)(1+c)^{-(n-1)}}{c^{2}n}}{F_c} = \frac{1}{cn}-\frac{1}{(1+c)^{n}-1} \text{ if } c>0; \qquad H = \frac{n-1}{2n} \text{ if } c=0. \tag{2}$$

The formula for $H$ is contained in cell S157. The desired steady-state ratio [this year's net PPE/revenues] is then

$$M(1-H). \tag{3}$$

This is the formula in cell S158 of Table 8.

The steady-state ratio [depreciation/last year's net PPE] is

$$\frac{1}{n}\cdot\frac{1}{1-H}.$$

This is the formula in cell S159 of Table 8.[6]

The steady-state ratios derived in this section apparently depend on four parameters, the real growth rate $g$, the inflation rate $i$ (since $c$ depends on $g$ and $i$), the capital intensity factor $K$, and the economic life $n$ of the PPE.[7] Armed with the formulas derived here, one can (to a limited extent; cf. Section 15 below) perform sensitivity analyses of how calculated equity value varies due to changes in these four parameters.

# 7 On the Implementation of Assumptions Relating to PPE

The forecast for the ratio [this year's net PPE/revenues] in the last year of the explicit forecast period can hence be obtained as equation (3) in the previous section, given that $n$, $g$, $i$, and $K$ have been specified. One parameter that may be difficult to specify is $K$.

[6]The steady-state formula for [retirements/last year's net PPE] is

$$\frac{(1+c)^{-n}}{F_c(1+c)^{-1}}\cdot\frac{1}{1-H} = \frac{1}{F_c(1+c)^{(n-1)}}\cdot\frac{1}{1-H}.$$

This is the formula in cell S160 in Table 8.

[7]Actually, steady-state [depreciation/last year's net PPE] and steady-state [retirements/last year's net PPE] depend on two parameters only, $c$ and $n$. That is, they do not depend on $g$ and $i$ separately. All that matters for these two ratios is nominal growth $c$, not how that growth comes about due to different combinations of real growth $g$ and expected inflation $i$.

At least in principle, an estimate of $K$ can be obtained from historical financial statements of the company being valued. For each one of the last $n$ historical years, one determines the capital expenditures, like in Table 3. Apparently, this means that $n+1$ sets of historical financial statements must be available. Each such amount except the last one is then inflated to the price level that is valid for the last historical year. This is done using some suitable time series of historical inflation rates during the $n-1$ last historical years. After that, all $n$ amounts are summed, and the sum is divided by revenues in the last historical year. The result is an estimate of $K$ at the end of the historical period. A forecast of $K$ in the last year of the explicit forecast period can then be obtained by assuming, e. g., a slightly lower value, reflecting some improvement in capital usage efficiency. In the McKay example, this procedure is not immediately applicable, since $n+1=11$ sets of historical financial statements are not available (financial statements are available only for 7 historical years). A somewhat similar procedure is actually used in the exact model in Section 15 below.

A more heuristic approach would be to set $K$ so as to obtain a "reasonable" value of the ratio [this year's net PPE/revenues] in the last year of the explicit forecast period, reasonable meaning in relation to what has actually been observed in historical years. It is assumed here that $g$, $i$, and $n$ have already been fixed. That is, $K$ is set after these other three. Under this more heuristic approach, there is no attempt to ascertain what $K$ has actually been in the historical period. One merely uses $K$ as a free parameter to obtain a forecasted value of the ratio [this year's net PPE/revenues] in the last year of the explicit forecast period that seems acceptable.

Another approach to setting $K$ is to take as a starting point the data base from Statistics Sweden that was mentioned in Section 4. It is indicated below, in Appendix 1, how that data base can be used to provide rough estimates of $K$. Table C in Appendix 1 contains suggested $K$ values for various industries. It has been noted in a number of valuation projects, though, that the $K$ values in that table often appear rather high. For instance, $K$ is seen to be equal to 0.81 for the land transportation industry (using data pertaining to 1994 - 1998). But that seems too high for the McKay example, even though it refers to a trucking company, and hence to the land transportation industry. One reason why it is too high could be that land transportation also includes railways, i. e., more capital intensive activities than trucking.

Without further justification, it is simply assumed here that $K$ is equal to 0.58 in the McKay case. This is the value for $K$ in year 11 that is shown in Table 8 (cell S155). Using equation (3), the value of [this year's net PPE/revenues] in the same year (cell S158) is then found to be 29.3%.

The McKay example considers only one homogeneous category of PPE with an assumed economic life of $n=10$ years (cell S152). One can of course set up a valuation model with different categories of PPE, e. g., machinery and buildings. The economic life of each category is sometimes mentioned in company annual reports. To cite only one example, the 1996 annual report of the Swedish company Rörviksgruppen states economic lives between 5 and 10 years for different types of machinery, and between 20 and 25 years for buildings and land improvements. The assumption that $n$ is integer is not restrictive, if different categories of PPE are considered, since individual categories can be thought of as having different integer economic lives.

To recapitulate, this section and the previous two have considered forecasts for three particular ratios, [this year's net PPE/revenues], [depreciation/last year's net PPE], and [retirements/last year's net PPE]. Steady-state values of these ratios can be specified for the last year of the explicit forecast period. Those steady-state values depend on real growth $g$, inflation $i$, PPE economic life $n$, and required real gross PPE divided by revenues $K$. They are consistent with the company developing in a steady-state fashion in the post-horizon period, and consequently with the general idea of dividing the future into explicit forecast and post-horizon periods. The steady-state assumption is obviously only an approximation: Successive PPE cohorts when entering the post-horizon period, as resulting from capital expenditures in the explicit forecast period, cannot be expected to satisfy precisely the even age distribution requirement. Also, real gross PPE when entering the post-horizon period cannot be expected to correspond exactly to what is needed according to the capital intensity factor $K$.

For the earlier years in the explicit forecast period, [this year's net PPE/revenues], [depreciation/last year's net PPE] and [retirements/last year's net PPE] have been set in a heuristic fashion in the McKay example (see Table 8): Values for the first year of the explicit forecast period have been set equal to the average of all corresponding historical ratios, or equal to the immediately preceding historical ratio. Values for intermediate years have been determined by interpolation between the first and last years of the explicit forecast period. This is an easy way of making forecasts for the earlier years of the explicit forecast period. It is proposed here as a simple-minded alternative to bottom-up forecasting of individual expenditures (new and replacement). The latter alternative is more accurate but also more complex, since it can usually only be done using information available within a company, i. e., not on the basis of published accounting data (Copeland et al. 2000, p. 256).

# 8 Forecast Assumptions Relating to Taxes

The next set of forecast assumptions in Table 8 refers to taxes. The corporate tax rate has apparently been 39% in all historical years and is forecasted to remain at that level in the future. The further tax assumption that must be fixed for future years is the ratio [timing differences/this year's net PPE]. This ratio relates to the balance sheet item deferred income taxes. That is, deferred income taxes are equal to (this year's net PPE) × [timing differences/this year's net PPE] × [this year's tax rate]. It may be noted that deferred income taxes are revalued when the tax rate changes (the so-called liability method of accounting for deferred taxes). The precise steps of that revaluation will be mentioned in Section 10 below. In the base case McKay scenario, there is actually no need for such a revaluation, since the tax rate is the same in all historical and future years. However, in a sensitivity analysis one may wish to assume a different tax rate for future years, e. g., starting with year 1 (cf. Section 13 below). If so, there will be an error in the free cash flow calculation, unless deferred income taxes are revalued.

The ratio [timing differences/this year's net PPE] can be set in the same fashion as in the previous three sections. That is, a value for the first year of the explicit forecast period is set as an average of the corresponding historical values. A value for the last year of the explicit forecast period is specified through steady-state considerations, like the values for the ratios relating to PPE. Values for intermediate years are then fixed by linear interpolation. This procedure has been followed in the McKay example.

As already indicated in Section 6, the life of the PPE for depreciation for tax purposes is denoted by $q$. It is obviously assumed that $q \leq n$. Also, it is assumed that each piece of PPE is depreciated linearly for tax purposes, i. e., by $1/q$ of the acquisition value each year.

If the steady-state condition holds, i. e., the acquisition values of successive PPE cohorts increase by $c$, then the ratio [timing differences/this year's net PPE] in the last year of the explicit forecast period can be written as

$$\frac{J}{F_c(1-H)}, \tag{4}$$

where

$$\begin{aligned} J &= \sum_{v=0}^{q-1}\left(\left(\frac{1}{1+c}\right)^v \cdot \frac{v}{q}\right) + \sum_{v=q}^{n-1}\left(\frac{1}{1+c}\right)^v - \sum_{v=0}^{n-1}\left(\left(\frac{1}{1+c}\right)^v \cdot \frac{v}{n}\right) \\ &= \frac{1+c-(qc+1)(1+c)^{-(q-1)}}{c^2 q} + \frac{1+c-(1+c)^{-(n-q-1)}}{c} \cdot \frac{1}{(1+c)^q} \\ &- \frac{1+c-(nc+1)(1+c)^{-(n-1)}}{c^2 n} \end{aligned}$$

if $c > 0$. The first term in $J$ represents accumulated fiscal depreciation for PPE cohorts that have not yet been written down to zero for tax purposes, the second term accumulated fiscal depreciation for those PPE cohorts that have already been written down to zero for tax purposes but have not yet been retired, and the third term accumulated depreciation over the economic lives for PPE cohorts that have not yet been retired. (Cf. the remark at the end of Section 3 to the effect that non-zero timing differences are related to non-retired PPE cohorts only; cf. also equation (2) in Section 6 for part of the derivation.) If $c = 0$, then

$$J = 0.5(q-1) + (n-q) - 0.5(n-1).$$

The formula for $J$ is contained in cell S165 in Table 8. Equation (4), the steady-state ratio [timing differences/this year's net PPE] in the last year of the explicit forecast period, is contained in cell S166.

# 9 Forecast Assumptions Relating to Discount Rates and Financing

Consider now the interest rate items in Table 8. McKay's real borrowing rate is apparently forecasted to be 6% in all future years. The nominal borrowing rate is the sum of the real rate and expected inflation.[8] The latter has already earlier been forecasted to remain at 3% in future years, so the nominal borrowing rate is 9% throughout. Incidentally, the forecasted nominal borrowing rate is assumed to be the going market rate for companies in McKay's risk class. This means that the market value of the interest-bearing debt is equal to the book value. In the valuation of the equity as a residual, the book value of the interest-bearing debt is subtracted from the value of the firm's assets. This procedure is correct only because of the equality between market and book debt values when the nominal borrowing rate is the same as the going market rate.

For calculating the WACC, the cost of equity capital is also needed. The real cost of equity capital is apparently assumed to be 11.8%. By adding assumed inflation, one obtains the nominal cost of equity capital 14.8%. It should be emphasized that the cost of equity capital, as well as the borrowing rate, is *not independent* of the debt and equity weights that enter into the WACC.[9] If those debt and equity weights are varied, then the

[8] It is assumed that the *before-tax* real borrowing rate remains constant under varying inflation expectations. The nominal borrowing rate in the example is then $(1+0.06)\times(1+0.03) - 1$. A different relationship between the nominal borrowing rate and expected inflation is obtained, if one assumes that it is the *after-tax* real borrowing rate that stays constant under varying inflation expectations. See Howe 1992 for a discussion of this issue. The assumption made here, that the before-tax real borrowing rate remains constant as inflation expectations change, seems to agree with empirical findings (Howe 1992, p. 34). The nominal borrowing rate $(1+0.06)\times(1+0.03) - 1$ is actually simplified to $0.06 + 0.03$, since the additive calculation agrees with how nominal interest rates are sometimes presented in elementary corporate finance courses. A similar remark applies to the manner in which inflation enters into the cost of equity (in the following paragraph).

[9] As will be seen below (Section 12), those weights are specified in terms of a *target capital structure*

borrowing rate and cost of equity capital should be varied as well. However, the precise relationship between, on the one hand, the debt and equity weights entering into the WACC and, on the other hand, the borrowing rate and cost of equity capital that also enter into the WACC is left unspecified in this tutorial. Hence, there is not much explicit modelling of the borrowing rate and cost of equity capital in Table 8. It should be noted, though, that both of these interest rate items depend on assumed inflation. If inflation increases, then so do the nominal borrowing rate and nominal cost of equity capital.

The next-to-last item in Table 8 is [book value target for financial strength]. Financial strength is defined as (invested capital *minus* interest-bearing debt) *divided by* invested capital (it is recalled from Section 3 that invested capital equals working capital *plus* net PPE). This ratio apparently refers to McKay's financing policy. The financing policy is the means to guarantee that there will be an equality between the assets and liabilities sides of the forecasted balance sheets. More precisely, total common equity or interest-bearing debt must be determined as the residual. Stated somewhat differently, dividends or net borrowing become the residual.

The following financing policy has been assumed for McKay: The company's recent performance has been rather shaky, as also evidenced by the fact that the ratio [interest-bearing debt/invested capital] at the bottom of Table 2 has increased substantially. McKay should try to reduce that ratio and hence improve its financial strength over the coming years (as viewed from the date of valuation, Jan. 1 of year 1). For that purpose, no dividends will be paid at all, as long as financial strength is below the target in row 175 of Table 8. Otherwise, maximal dividends are paid out, while still keeping financial strength as required. Obviously, this is only intended as one example of a financing policy that can be incorporated into the McKinsey model. A *book value* target for financial strength can conveniently be adjusted to provide a target capital structure *in market value terms* in the first year of the post-horizon period.[10]

Consequently, there is a book value target for financial strength. Borrowing as well as dividends are adjusted to reach that target (however, negative dividends are not allowed). Deferred income taxes are viewed as part of equity in the McKinsey model (cf. also Brealey and Myers 2002, p. 528). Deferred income taxes are hence not subtracted in the calculation of equity value as a residual. McKay's book value target for financial strength in row 175 in Table 8 can therefore be restated as follows: The sum of the three items deferred income taxes, common stock, and retained earnings on the liabilities side of the balance

*in market value terms in the first year of the post-horizon period.* The same weights are then applied in all of the years of the explicit forecast period, and in all later years of the post-horizon period.

[10] In fact, the book value target for financial strength 57.2% mentioned below has been selected so as to reach a target capital structure in market value terms in year 12 of 50% equity and 50% debt (cf. Section 12).

sheet should equal 57.2% of invested capital. Equivalently, interest-bearing debt should be 42.8% of invested capital. Apparently, the assumption is that book value financial strength should be the same each year.

The financial structure of the firm, including the dividend policy, actually does not affect the computed free cash flow. The financial structure does affect the *valuation* of free cash flow, though, through the WACC computation.[11]

The final item in Table 8 is [this year's short-term interest-bearing debt/last year's long-term interest-bearing debt]. This ratio only serves to divide total interest-bearing debt in the forecasted balance sheets into short-term and long-term. It does not have any effect on the valuation in the McKay example, since the nominal borrowing rate does not depend on loan contract length.

There are no further assumptions for forecasting income statements and balance sheets in Table 8. However, a couple of additional assumptions have been incorporated directly into the forecasted financial statements, i. e., not by way of ratios in Table 8. It is directly assumed that there will be no new issue of equity (i. e., the item common stock in the balance sheets remains at the same level as in the last historical year). Also, the excess marketable securities are assumed to remain at zero in all forecasted balance sheets. Consequently, there is zero interest income in all forecasted income statements.

## 10 Forecasted Income Statements, Balance Sheets, and Free Cash Flow

With the forecast assumptions in Table 8 and the additional assumptions that were noted in the previous section, we can now construct the forecasted income statements in Table 5 and forecasted balance sheets in Table 6 for years 1 to 12. Revenues in Table 5 are (last year's revenues)×(1 plus [revenue growth]) ([revenue growth] is taken from Table 8). Operating expenses are revenues multiplied by [operating expenses/revenues] (also from Table 8). Depreciation in Table 5 is last year's net PPE multiplied by [depreciation/last year's net PPE] (from Table 8). Interest income is set to zero in all years as a direct forecast, as already mentioned in the previous section. Interest expense is the assumed nominal borrowing rate (from Table 8) applied to the sum of last year's short-term and long-term debt.

The item revaluation of deferred income taxes in Table 5 is obtained by recomputing last year's deferred income taxes in accordance with this year's tax rate and subtracting the result from last year's deferred income taxes as stated in last year's balance sheet. The

[11] Financial structure may affect computed free cash flow in more complex situations, for instance if the company has tax-loss carry-forwards.

recomputation part consists of dividing last year's deferred income taxes by last year's tax rate (from Table 4 when the last year is year 0 and otherwise from Table 8) to obtain last year's timing differences, and then multiplying those timing differences by this year's tax rate (from Table 8). Income taxes in Table 5 are computed by applying this year's tax rate from Table 8 to earnings before taxes (i. e., not including revaluation of deferred income taxes).

The statement of retained earnings is completed by invoking the book value target for financial strength that was formulated in the previous section: The sum of deferred income taxes, common stock, and retained earnings should be 57.2% of invested capital. However, negative dividends are not allowed (and by assumption a new issue of equity has also been ruled out). This means that ending retained earnings are set as the minimum of the following two:

(Beginning retained earnings) + (net income),
0.572×(invested capital) − (deferred income taxes) − (common stock).

Consequently dividends are the residual item in a forecasted statement of retained earnings:

Dividends = (beginning retained earnings) + (net income)
− (ending retained earnings).

The items in the forecasted balance sheets, Table 6, are to a large extent directly driven by revenues. That is, they are given by revenues multiplied by the relevant forecast assumptions in Table 8. This holds for all current assets items (except excess marketable securities, which are directly set to be zero; cf. Section 9) and for accounts payable and other current liabilities. Net PPE is similarly driven by revenues. Accumulated depreciation is last year's accumulated depreciation *plus* this year's depreciation (from Table 5) *minus* this year's retirements. This year's retirements equal (last year's net PPE)×[retirements/last year's net PPE] (from Table 8). Gross PPE is then calculated as net PPE *plus* accumulated depreciation. It is again pointed out that gross PPE and accumulated depreciation are actually not needed. That is, rows 48 and 49 in Table 6 could have been left blank.

Short-term debt is specified as a fraction (from Table 8) of last year's long-term debt. Deferred income taxes are specified as (this year's net PPE) × [timing differences/this year's net PPE] × [this year's tax rate], as already mentioned in Section 8 above. Common stock is set to be the same as in year 0, as already explained. Retained earnings are copied from the same item in the statement of retained earnings in Table 5. Long-term debt then becomes the residual item, to obtain equality between assets and liabilities in each forecasted balance sheet. It is seen at the bottom of Table 6 that the 42.8% target for debt to invested capital that is implied by the book value target for financial strength is reached in year 4, and that the ratio [NOPLAT/invested capital] is expected to be somewhat better on average than in recent historical years. All items in the forecasted income statements and balance sheets should be interpreted as expected values under some scenario.

Finally, forecasted free cash flow for each year 1 to 12 is displayed in Table 7. That table is derived from Tables 5 and 6 in essentially the same fashion as Table 3 is derived from Tables 1 and 2. The item revaluation of deferred income taxes was not commented on in Section 3. By including that item in the free cash flow calculation, one obtains the correct result that the revaluation does not affect free cash flow.

By depreciating PPE for tax purposes over a time period shorter than the economic life, a company can decrease its effective tax rate below the nominal rate, as long as nominal revenues are increasing. At the bottom of Table 7, the effective rate of taxes paid on EBIT is exhibited. That rate is computed by dividing (taxes on EBIT) *minus* (change in deferred income taxes) *minus* (revaluation of deferred income taxes) by EBIT. In steady state, the effective tax rate is apparently 36.2%, i. e., not much lower than the nominal rate of 39%.

# 11 Another System for Tax Accounting

The particular system for accounting for deferred income taxes that has been discussed in previous sections is a somewhat extended interpretation of the tax accounting system in the original Preston example in Copeland et al. 1990 and Copeland et al. 1994. A fairly similar tax accounting system is often used by Swedish company groups. In this section, a somewhat different tax accounting system is considered. Individual Swedish companies often use something like this alternative system. A print-out from the file MCK_1B.XLS, containing the McKay example under the alternative tax accounting system, is also included at the end of this tutorial. It is seen that MCK_1B.XLS is very similar to MCK_1.XLS. That is, it consists of the same Tables 1 to 8, and with the same value calculation part at the end.

Under the tax accounting system in MCK_1B.XLS, timing differences appear as an *untaxed reserve* on the liabilities sides of the balance sheets, replacing the item deferred income taxes on the liabilities sides of the balance sheets in MCK_1.XLS. The forecast assumptions for timing differences are exactly the same under the two tax accounting systems. In particular, the ratio [timing differences/this year's net PPE] is exactly the same in both cases.

The increase or decrease in timing differences appears as an item in the income statements, before income taxes. As a consequence, the layout of the calculation of free cash flow changes slightly. It is seen that the resulting free cash flow is the same in both cases (compare row 113 of MCK_1B.XLS with row 109 of MCK_1.XLS). This is of course only what one would expect, since the underlying tax rules (for instance, the life $q$ for fiscal depreciation) are the same. The free cash flow calculation in MCK_1B.XLS is actually somewhat simpler than the corresponding calculation in MCK_1.XLS, since in the former there is no need for a revaluation of deferred income taxes, if there is a change in the tax rate.

In the forecasted statements of retained earnings in MCK_1B.XLS, ending retained earnings are set as the minimum of the following two:

(Beginning retained earnings) + (net income),
0.572×(invested capital) − (timing differences) − (common stock).

In all of the historical years −6 to 0, the sum of the two items timing differences and retained earnings in the balance sheets of MCK_1B.XLS is equal to the sum of deferred income taxes and retained earnings in the balance sheets of MCK_1.XLS. The same also holds for all forecasted balance sheets, as a consequence of the very similar condition on ending retained earnings that is imposed under both tax accounting systems. It also follows that each year's common dividends are the same in both cases, even though net income is not. The financial cash flow computations give identically the same result, item by item, in the two cases.

It may be added that the treatment of taxes in this tutorial is somewhat simplistic in one respect. In deducting depreciation for tax purposes, one would normally have to check that such depreciation does not bring taxable income below zero. Also, taxes actually paid in a given year presumably cannot be negative. These conditions are satisfied in the McKay forecasted income statements and balance sheets. However, explicit checks of these conditions have not been included in MCK_1.XLS and MCK_1B.XLS. Indeed, looking at the historical income statements in the latter file, one notices that net income in year −1 is actually negative (−0.5). This indicates that the increase in timing differences in that year may have been too big. This anomaly is not so clearly evident in the corresponding net income for year −1 in MCK_1.XLS. The alternative tax accounting system in MCK_1B.XLS may hence be somewhat more transparent in setting up forecasted income statements and balance sheets in a valuation situation.

# 12 Valuation of McKay's Equity

We now return to the file MCK_1.XLS. From now on, all references to spreadsheet cells or rows refer to that file, unless otherwise stated. Having forecasted the free cash flow for each year of the explicit forecast period and the first year of the post-horizon period, it is now possible to calculate the value of McKay's equity. The value calculation part of the spreadsheet file starts by repeating certain items that are necessary for that calculation, in particular: The book value of excess marketable securities at the beginning of each forecast year, the book value of interest-bearing debt (short-term and long-term) also at the beginning of each year, and the free cash flow. The latter is assumed to occur at the end of each forecast year. As already mentioned in Section 9, the book value of the interest-bearing debt is assumed equal to the market value. The same assumption is actually also imposed for excess marketable securities (however, that is not important here, since there are zero excess marketable securities in McKay's balance sheets starting with year 0).

The general procedure is the following: To begin with, the value of the firm's operations is computed as of the beginning of the first year of the post-horizon period, i. e., at the horizon. This value is obtained by the Gordon formula. The free cash flow at the end of the first year in the post-horizon period (28.2) increases by a specified growth rate year by year over an infinite number of years. (The specified growth rate in the McKay example is 3%, due to inflation only, as already indicated earlier.) The WACC in the first year of the post-horizon period turns out to be 10.1% (somewhat rounded), so the result of the Gordon formula is $28.2/(0.101-0.03) = 394.8$. How the WACC has been calculated will be discussed in greater detail below. To the value of operations 394.8 is added the value of excess marketable securities (0.0) at the same point in time, i. e., at the beginning of the first post-horizon year. This gives the total value of the firm's assets. From that total asset value is deducted the value of interest-bearing debt (197.4). The resulting equity value (including deferred income taxes) is 197.4. The debt and equity values are apparently equal. This is no coincidence, since a *target capital structure in market value terms* of 50% equity and 50% interest-bearing debt has, in fact, been assumed, as will be seen shortly.

After that, a similar calculation is performed for the immediately preceding year, i. e., the last year of the explicit forecast period. The value of the operating assets at the beginning of the following year, which is also the end of the current year (394.8), *plus* the free cash flow at the end of the current year (33.8) are discounted to the beginning of the current year, using the current year's WACC. Again, this provides the value of the firm's operations (389.1) at the beginning of the current year. Adding the excess marketable securities at the same point in time (0.0) and subtracting the debt value (194.9), one obtains the equity value at the beginning of the current year (194.2). The computations proceed in this manner, by discounting backwards year by year, until one reaches the beginning of the first year of the explicit forecast period which is also that moment in time when the valuation is done. Jumping to the conclusion, it is seen that McKay's equity (again including deferred income taxes) is valued at 83.0 as of Jan. 1 year 1.

The computations apparently proceed backwards one year at a time. The value of the firm's operations at the beginning of any one year in the explicit forecast period is the present value of the sum of the value of the operations at the beginning of the following year *plus* this year's free cash flow. It is not difficult to see that this way of stepping backwards one year at a time gives the same result as directly discounting all yearly free cash flow amounts to a present value as of Jan. 1 year 1. However, the procedure suggested here is more general, since it permits the computation of equity value at the beginning of each year in the explicit forecast period, not only at the beginning of year 1. This may be of interest; cf. row 198 of the value calculation part of the spreadsheet file.

The specification of the WACC is the standard one, well known from corporate finance texts. It is again convenient to introduce some notation:

| | |
|---|---|
| $E$ | market value of equity, |
| $D$ | market value of debt, |
| $r_E$ | required nominal rate of return on equity, |
| $r_D$ | nominal cost of debt (assumed equal to nominal borrowing rate), |
| $\tau$ | tax rate. |

The WACC formula is then[12]

$$r_E \frac{E}{D+E} + r_D(1-\tau)\frac{D}{D+E}. \tag{5}$$

Equation (5) is the WACC formula that is used for the first year of the post-horizon period, year 12. The parameters $r_D$, $r_E$, and $\tau$ are given for each year in the forecast assumptions, Table 8. $D$ and $E$ are market values. $D$ is, by assumption, equal to the book value of the interest-bearing debt.

It is now possible to be more precise about the discounting operation in each year of the value calculation. For the first post-horizon year, a *desired market value weight* of equity $E/(D+E)$ is specified in cell I200. The corresponding market value weight of debt is hence $D/(D+E) = 1 - E/(D+E)$. Apparently, it has been specified in this case that the *target capital structure in market value terms* should be 50% equity and 50% debt. Using those weights for debt and equity, the WACC is calculated in cell T193. It turns out to be 10.1%. With that WACC value, the value of the operating assets is determined (cell T195), as indicated earlier. To that value is added excess marketable securities. Next, interest-bearing debt is subtracted, meaning that the equity value is obtained as a residual. At this point, the *resulting* market value weight of equity is determined in cell T202. (In other words, the contents of cell T202 is =T198/(T191+T198).) Cell I201 contains a copy of cell T202 (i. e., the contents of cell I201 is =T202).

[12]It is seen that the WACC is obtained in this tutorial as a weighted average of *nominal* after-tax interest rates. An alternative procedure would be to take a weighted average of *real* after-tax interest rates and then adjust for expected inflation. The procedure in this tutorial actually follows from the assumption, mentioned in a footnote in Section 9, that the *before-tax* real borrowing rate remains constant under varying inflation expectations. The resulting value of WACC is somewhat lower than under the alternative procedure. Cf. again Howe 1992.

The simultaneity problem that was mentioned in Section 2 above is now resolved, if the resulting $E/(D+E)$ in cell I201 is the same as the desired $E/(D+E)$ in cell I200. Cell I203 contains the difference between cells I200 and I201 multiplied by 100,000 (although as a hidden entry). The contents in cell I203 can be driven to zero, through a suitable choice, more precisely 57.2% (somewhat rounded), of the book value target for financial strength for year 1 in cell I175 (Table 8). If that target is changed for year 1, it also changes for years 2 through 12, since it is the same for all years in Table 8. Driving the contents of cell I203 to zero by adjusting cell I175 is most easily done using the Goal Seek procedure.

Equality between cells I200 and I201 implies a solution to the simultaneity problem. Resolving that problem actually does not affect the WACC for year 12, since that discount rate is, in any case, already determined by the desired weight $E/(D+E)$ that is specified in cell I200. Resolving the simultaneity problem only means adjusting the liabilities side of the balance sheet for year 12, so that the book value of interest-bearing debt becomes equal to its computed market value (being 50% of the market value of the company). At the same time the balance sheets for all previous years are also adjusted, since the book value target for financial strength changes for all years in the explicit forecast period as well.

The WACC for each year in the explicit forecast period is calculated according to formula (5) as well, however *using the desired capital structure in market value terms with weights $E/(E+D)$ and $D/(E+D)$ as specified for the first year of the post-horizon period*. This is in line with a recommendation by Copeland et al. (2000, pp. 203-204): The estimated WACC should be founded on a target capital structure for the firm.[13] In this tutorial, that target capital structure is supposed to be attained at the outset of the post-horizon period, when the company develops in a steady-state fashion.

To summarize, the target capital structure is set for the first year of the post-horizon period. The same capital structure is then imposed for all preceding years (i. e., all years in the explicit forecast period), and also for all subsequent years in the post-horizon period (through the Gordon formula discounting).

It is not excluded that the WACC can vary over the years in the explicit forecast period, even though each year's WACC uses the capital structure value weights $E/(E+D)$ and $D/(E+D)$ from the first year in the post-horizon period. The reason is, the other variables that enter into the WACC calculation can vary over individual years. Indeed,

[13] The target capital structure considered here is in terms of market values. It is not the same as the book value target for financial strength (interest-bearing debt should be 42.8% of invested capital) that was assumed in Section 9. However, the former is obviously related to the latter, since the latter is varied in the Goal Seek procedure, so that the former is attained in the first year of the post-horizon period. It may be noted that both the book value target for financial strength and the target capital structure in market value terms are satisfied every year of the post-horizon period.

the relevant interest rate items as well as the tax rate are specified for each year separately in the forecast assumptions in Table 8.

With the model implementation suggested here, it is actually not even necessary to resolve the simultaneity problem that was mentioned above. That is, the capital structure in market value terms that is defined by the desired weight $E/(D+E)$ for the first year of the post-horizon period is sufficient to specify the WACC for every single year in the explicit forecast and post-horizon periods (given the other assumptions, i. e., borrowing rate, cost of equity capital, and tax rate). Free cash flow does not depend on the capital structure, as has already been mentioned in Section 9. Hence, the actual breakdown into debt and equity of the liabilities sides of the forecasted balance sheets does not matter. The breakdown into debt and equity at the valuation date does matter (since equity value is calculated as a residual), but that breakdown is taken from the last historical set of financial statements, not from forecasts.

# 13 Sensitivity Analysis: Valuation under Different Scenarios

The value of McKay's equity, found to be 83.0 in the previous section, is valid under that particular base case scenario that is defined by the forecast assumptions in Table 8 and the further assumptions (noted in Section 9) that were directly incorporated into the forecasted financial statements.[14] Valuation results for some alternative scenarios are given in Table A. Columns (a) and (b) show results for the model that has been presented so far in this tutorial (i. e., the McKinsey model as interpreted by the present author, referred to as the "net PPE McKinsey model" in Table A and in Section 15 below). The value in column (b) is the value of the firm's operations at the beginning of the first post-horizon year. Column (c) refers to the abnormal earnings model that is discussed in the following section. Columns (d), (e), and (f) contain results from two further discounted cash flow model versions, labelled the "gross PPE McKinsey model" and the "exact model". These models will be discussed in Section 15 below.

Scenario 2 calls for a 1% increase in the real growth rate starting year 10, as compared

[14]Copeland et al. (2000, pp. 134, 294-295) recommend an adjustment to account for the fact that free cash flow on average occurs in the middle of each year, not at the end. This is accomplished by compounding one half year forward the computed value of the operating assets at the date of valuation. The compounding rate should be the first year's WACC. In the McKay case, that would result in a calculated value of the operating assets of $198.5 \times 1.05$ (somewhat rounded), equal to 208.6. Deducting the value of interest-bearing debt 115.5, one obtains the computed equity value 93.1 rather than 83.0. This recommendation is not followed here, since the meaning of such an adjustment seems less clear for the abnormal earnings model.

### Table A. McKay valuations under different scenarios

| No. | Description of scenario | (a) | (b) | (c) | (d) | (e) | (f) |
|---|---|---|---|---|---|---|---|
| 1 | Base case | 83.0 | 394.8 | 86.2 | 86.7 | 76.4 | 401.3 |
| 2 | + 1% real growth from year 10 | 82.6 | 409.2 | 85.9 | *92.1* | 76.5 | 415.8 |
| 3 | + 1% inflation from year 11 | *85.7* | 389.9 | *88.1* | *100.8* | 73.5 | 396.9 |
| 4 | − 1% inflation from year 11 | *79.8* | 399.3 | *83.9* | *71.3* | 79.2 | 405.3 |
| 5 | + 1% inflation from year 1 | 74.6 | 429.4 | 79.8 | 79.0 | 71.0 | 436.6 |
| 6 | − 1% inflation from year 1 | 91.1 | 362.2 | 92.6 | 93.9 | 81.6 | 368.2 |
| 7 | − 1% [operating expenses/revenues] from year 1 | 157.3 | 506.1 | 155.3 | 161.0 | | |
| 8 | + 1% [operating cash/revenues] from year 1 | 71.8 | 389.5 | 77.6 | 75.5 | | |
| 9 | Capital intensity factor $K$ 0.53 rather than 0.58 | 122.6 | 453.4 | 125.1 | 136.4 | | |
| 10 | Economic life $n$ of PPE 9 rather than 10 years | 39.0 | 319.2 | 51.8 | 42.4 | | |
| 11 | Tax rate 42% rather than 39% from year 1 | 71.8 | 376.2 | 77.0 | 75.2 | | |
| 12 | Tax life $q$ of PPE 6 years rather than 5 years | 74.3 | 389.4 | 79.3 | 78.2 | | |
| 13 | + 1% interest rates (borrowing and equity) from year 1 | 56.1 | 354.8 | 64.2 | 59.7 | | |

Explanations:
(a) Net PPE McKinsey model, equity value Jan. 1 year 1
(b) Net PPE McKinsey model, value of the firm's operating assets Jan. 1 year 12
(c) Net PPE abnormal earnings model, equity value Jan. 1 year 1
(d) Gross PPE McKinsey model, equity value Jan. 1 year 1
(e) Exact model, equity value Jan. 1 year 1
(f) Exact model, value of the firm's operating assets Jan. 1 year 12
Values in *italics* denote sensitivity analyses that are not valid; cf. Section 15 below.

### Table B. Cash flow from new investment

| Cash flow element | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Investment in PPE | -58.0 | | | | | | | | | | |
| Revenues | 100.0 | 103.0 | 106.1 | 109.3 | 112.6 | 115.9 | 119.4 | 123.0 | 126.7 | 130.5 | |
| Operating expenses | -90.0 | -92.7 | -95.5 | -98.3 | -101.3 | -104.3 | -107.5 | -110.7 | -114.0 | -117.4 | |
| Investment in working capital | -7.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.2 | -0.3 | -0.3 | -0.3 | 9.4 |
| Taxes on revenues minus expenses | -3.9 | -4.0 | -4.1 | -4.3 | -4.4 | -4.5 | -4.7 | -4.8 | -4.9 | -5.1 | |
| Tax savings on fiscal depreciation | | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | | | | | |
| Cash flow from investment | -59.1 | 10.6 | 10.8 | 11.0 | 11.2 | 11.4 | 7.0 | 7.2 | 7.5 | 7.7 | 9.4 |

to the base case scenario with zero real growth from that year. That is, there is an additional growth opportunity under that scenario. The value of such a growth opportunity can be studied directly, by considering its associated cash flow, as in Table B. That table considers an investment in year 10 that is supposed to support revenues of 100 (arbitrarily scaled) monetary units starting that year. The necessary investment in PPE is then 58.0. Revenues increase by 3% per year, due to assumed inflation. The revenue stream goes on for 10 years, since that is the assumed economic life of the PPE. Operating expenses (being cash costs) are 90% of revenues. There is also investment in working capital, since the latter is driven by, i. e., proportional to, nominal revenues, as already mentioned in Section 4 above. The investment in working capital is recouped at the end of the project. The tax consequences of the project are also listed in Table B. The last line of that table contains cash flow from the project starting year 10 and ending year 20. It may be noted that the amounts in Table B have been rounded to one decimal point.

If one discounts the cash flow in Table B to a present value, at the WACC that is valid for year 10 and later years under the base case scenario, 10.1% (somewhat rounded), then the net present value is positive but very small (0.1). In other words, a growth opportunity has almost zero value, for instance because the forecast ratio [operating expenses/revenues] is rather high. One can now compare that conclusion to the information in Table A. Compared to the base case value of 83.0, a 1% increase in real growth from year 10 leads to a slightly reduced valuation of McKay's equity (82.6). Strictly speaking, this is not entirely correct, since we know that there should be a very slight increase. However, the decrease comes about through the linear interpolation of forecast ratios relating to PPE in the explicit forecast period. In particular, the steady-state ratio [this year's net PPE/revenues] increases with $g$. Through the interpolation procedure, that ratio also increases somewhat in the earlier years of the explicit forecast period, with the implication that capital expenditures increase somewhat during that period, compared to the base case scenario. This explains the slight decrease in value of McKay's equity under scenario 2. (Incidentally, it is unrealistic to imagine that real growth of revenues in the post-horizon period could be higher than the expected long-term real growth of the surrounding economy as a whole.)

The following two scenarios 3 and 4, implying changes in expected inflation starting from the last year of the explicit forecast period, are not valid as sensitivity analyses. This is due to the manner in which the explicit forecast period has been set up in this tutorial. As can be seen from a comparison with the corresponding results of the exact model in column (e) of Table A, the changes in computed value of McKay's equity are in the wrong direction. This matter will be commented on further in Section 15 below. The source of the error, again, is the linear interpolation of forecast ratios relating to PPE in the explicit forecast period.

Scenarios 5 and 6 involve changes in the assumed inflation rate starting in the first year of the explicit forecast period. This time the conclusions are essentially correct. A change in forecasted inflation evidently affects forecasted revenues and operating expenses. Moreover, $F_c$ for year 11 changes, and consequently also the ratios [this year's net PPE/revenues], [depreciation/last year's net PPE], and [timing differences/this year's net PPE] in the same year. This means that these ratios also change for all intermediate years in the explicit forecast period, due to the interpolation between the first and last years of that period. The nominal borrowing rate and the nominal cost of equity also change, since forecasted inflation enters into those interest rates. As can be expected, higher inflation is unfavorable, and lower favorable, but the effect on the value of McKay's shares of a moderate change in assumed inflation seems fairly small.

Scenario 7 shows that a 1% change in [operating expenses/revenues] has a very large impact on equity value. In fact, this ratio would seem to be the most critical forecast item in Table 8. A 1% increase in the ratio of required working capital to revenues (exemplified in Scenario 8 by [operating cash/revenues]) apparently has a much smaller impact.

Scenarios 9 and 10 consider effects of changes in assumptions as regards productivity of PPE. A change in the capital intensity factor $K$ affects the ratio [this year's net PPE/revenues] in year 11 and also in earlier years, because of interpolation. A change in assumed economic life of PPE induces changes in that ratio and also in [depreciation/last year's net PPE] and [timing differences/this year's net PPE]. The resulting impact on equity value is seen to be quite important in both cases.

A moderate tax rate change (Scenario 11) has only a moderate effect on equity value. Free cash flow is reduced, as the tax rate is increased, but there is a counteracting force through deferred income taxes. A tax rate change also finds its way into the WACC calculation, through formula (5) in the previous section. An increase in the assumed life of PPE for tax depreciation purposes from 5 to 6 years results in only a fairly small decrease in value of McKay's equity (Scenario 12).

Scenario 13 emphasizes the importance of a single percentage point in the discount rate (WACC) in connection with firm valuation. A 1% increase in the discount rate without an accompanying increase in expected inflation could come about through similar increases in the real borrowing rate and the real cost of equity capital.

# 14 The Abnormal Earnings Model

Now consider the abnormal earnings model. According to this model, computed equity value is equal to book equity value *plus* the present value of all abnormal earnings. Discounting is done using the required rate of return on equity. The second half of the value calculation part of the spreadsheet file lists information that is necessary for applying the abnormal earnings model, in particular the book equity value at the beginning of each forecast year and the net income, assumed to occur at the end of each forecast year. Interest-bearing debt at the beginning of each forecast year is also listed. These items are copied from Tables 2, 5, and 6 above.

The discounting procedure for abnormal earnings is actually fairly similar to the procedure for free cash flow. The required rate of return on equity is 14.8% in the first year of the post-horizon period, taken from Table 8. *Abnormal earnings* are equal to the year's net income minus a capital charge, the latter being the product of the required rate of return on equity and the book equity value at the beginning of the year. That is, $-0.6$ in cell T216 equals $29.4 - 0.148 \times 202.3$. Abnormal earnings in the first post-horizon year are hence $-0.6$. Because of the way forecasted financial statements are generated in this tutorial (in particular, the fact that *net* rather than *gross* PPE is driven by revenues), abnormal earnings increase exactly by the assumed nominal growth rate 3% in subsequent years in the post-horizon period. In other words, abnormal earnings in the second post-horizon year are $-0.6\times1.03$, etc. Computed equity value at the beginning of the first post-horizon year is then equal to the sum of book equity value at the beginning of that year and the present value of all subsequent abnormal earnings. That is, 197.4 in cell T218 equals 202.3 + ($-0.6/(0.148-0.03)$). This is evidently another application of the Gordon formula.

After that, equity value is computed for the immediately preceding year, i. e., the last year of the explicit forecast period. The computed value of equity in cell S218 equals book equity value at the beginning of the same year in cell S213 plus the sum of abnormal earnings in the current year (cell S216) and present value of subsequent abnormal earnings in the following year (cell T218 minus cell T213), with this sum being discounted at the year's cost of equity capital.[15] This provides the computed value of the equity at the beginning of the current year. One proceeeds in this fashion, one year at a time and backwards, until one reaches the beginning of the first year of the explicit forecast period, which is also the moment in time when the valuation is done. Apparently, the equity value is found to be 85.6 as of Jan. 1 year 1.

As in the discounting of free cash flow in the McKinsey model, the computations proceed backwards one year at a time. Again, it is not difficult to see that stepping backwards one year at a time in the fashion outlined in the previous paragraph provides the same result as directly discounting all yearly abnormal profits and adding to the book equity value at the beginning of year 1.

A target market value weight of equity $E/(D+E)$ is specified in cell I220. As in Section 12, this means that a *target* capital structure in market value terms has been specified for the first year of the post-horizon period. With the required rate of return on equity as specified in Table 8 for the same year, equity value is computed in cell T218, as already explained above.[16] At this point, the values of debt and equity in cells T211 and T218 are used to compute the *resulting* market value weight of equity, in cell T222. From there, it is copied to I221. Cell I223 contains the difference between cells I220 and I221 multiplied by 100,000 (a hidden entry). Just as in Section 12, that difference can be driven to zero by adjusting the book value target for financial strength for year 1 in cell I175 (Table 8). (Again, it is convenient to do this by the Goal Seek procedure.) In other words, the simultaneity problem that was mentioned in Sections 2 and 12 is resolved. In

[15]The contents of cell S218 is hence =S213 + ((S216+T218−T213)/(1+S215)).

[16]It is again pointed out that the required rate of return on equity capital is not independent of the target market value weight $E/(D+E)$. However, the precise nature of that dependence is not specified in the model.

Section 12, it was actually not necessary to resolve that simultaneity problem. That is not so here. In other words, in the application of the abnormal earnings model it is necessary to adjust interest-bearing debt so that the resulting market value weight of equity agrees with the desired market value target capital structure.

One can now compare the McKinsey model and the abnormal earnings model when applied to the McKay example. The underlying forecast assumptions and forecasted income statements and balance sheets are the same (assuming that the simultaneity problem is actually resolved under the McKinsey model). The calculation of free cash flow in Table 7 is evidently not needed for the abnormal earnings model. Apparently, the McKinsey and abnormal earnings models do not give exactly the same computed value of McKay's equity as of Jan. 1 year 1. However, the sum of debt and equity values at the beginning of the first post-horizon year, as resulting from the abnormal earnings model, is precisely equal to the value of the firm's operating assets at the same point in time, as resulting from the McKinsey model.[17] Again, this is due to the particular manner in which forecasted financial statements have been generated in the McKay example, leading to abnormal earnings that increase exactly by the assumed nominal growth rate, starting in the second year of the post-horizon period. The differences between columns (a) and (c) in Table A are hence entirely due to different treatments of the explicit forecast period.

It may also be noted that the abnormal earnings model in file MCK_1B.XLS gives exactly the same result (computed equity value) as the corresponding model in file MCK_1.XLS. In other words, even though each year's net income changes with the change in tax accounting system (compare row 218 of MCK_1B.XLS with row 214 of MCK_1.XLS), there is no change in computed equity value. The significant observation is that forecasted dividends are the same under both tax accounting systems. Equity value can be determined by discounting forecasted dividends by the required rate of return on equity. The forecasted dividends and the required rate of return on equity are the same between MCK_1.XLS and MCK_1B.XLS, so the equity value that is obtained by discounting dividends must be the same under both tax accounting systems. It is also known that the abnormal earnings model is equivalent to the dividend discount model, if the clean surplus relationship holds (Young et al. 1999, p. 23). Hence, the abnormal earnings model clearly must provide the same computed equity value under both tax accounting systems.

[17] Strictly speaking, it is the firm's operating assets *plus* excess marketable securities according to the McKinsey model that have the same value as the sum of debt and equity according to the abnormal earnings model, at the beginning of the first post-horizon year. However, excess marketable securities are by asumption zero in the case of McKay.

# 15 Two Model Variants as Regards PPE

This section investigates alternative ways of modelling PPE, capital expenditures, and deferred income taxes, by means of two model variants labelled the gross PPE McKinsey model and the exact model.[18] It should be emphasized that all other assumptions, e. g., as regards nominal growth, operating expenses, working capital, and interest rate items, are exactly as before. The purpose here is only to explore the effects of different specifications related to PPE. The McKinsey model as outlined earlier in this tutorial will be referred to in this section as the net PPE McKinsey model. Similarly, the abnormal earnings model that was discussed in the previous section will be referred to as the net PPE abnormal earnings model.

The *gross PPE McKinsey model* is founded on the following equations relating to capital expenditures and PPE:

$$\begin{aligned}
&(\text{capital expenditures})_t = (\text{gross PPE})_t - (\text{gross PPE})_{t-1} + \text{retirements}_t \\
&\qquad = (\text{net PPE})_t - (\text{net PPE})_{t-1} + \text{depreciation}_t, \\
&(\text{gross PPE})_t = \text{revenues}_t \times [\text{this year's gross PPE/revenues}], \\
&\text{depreciation}_t = (\text{gross PPE})_{t-1} \times [\text{depreciation/last year's gross PPE}], \\
&\text{retirements}_t = (\text{gross PPE})_{t-1} \times [\text{retirements/last year's gross PPE}], \\
&(\text{accumulated depreciation})_t \\
&\qquad = (\text{accumulated depreciation})_{t-1} + \text{depreciation}_t - \text{retirements}_t, \\
&(\text{net PPE})_t = (\text{gross PPE})_t - (\text{accumulated depreciation})_t.
\end{aligned}$$

These six equations should be compared to the three necessary equations at the beginning of Section 5 above. The main difference between the gross and net PPE models is that it is no longer *net* but *gross* PPE that is driven by revenues.

The gross PPE McKinsey model apparently requires three forecast ratios to be set for each future year, [this year's gross PPE/revenues], [depreciation/last year's gross PPE], and [retirements/last year's gross PPE]. In the gross PPE model, the ratio [this year's gross PPE/revenues] is set equal to $M$ for the last year of the explicit forecast period (and hence also for all years of the post-horizon period). For the first year of the explicit forecast period, that ratio is set equal to the average of all corresponding historical ratios. The ratio [depreciation/last year's gross PPE] is set equal to $1/n$ for the last year of the explicit forecast period. For the first year of that period, it is set equal to the average of all corresponding historical ratios. The ratio [retirements/last year's gross PPE] is set equal to $1/(F_c(1+c)^{(n-1)})$ in the last year of the explicit forecast period. For the first year of that period, it is set equal to the immediately preceding historical ratio.

Deferred income taxes are determined in the following manner in the gross PPE model: (this year's gross PPE) × [timing differences/this year's gross PPE] × [this year's tax rate].

[18] These model variants are not included in the Excel files MCK_1.XLS or MCK_1B.XLS.

The ratio [timing differences/this year's gross PPE] is set equal to $J/F_c$ for the last year of the explicit forecast period and equal to the average of all corresponding historical ratios for the first year of that period. All of these ratios are determined through linear interpolation for intermediate years of the explicit forecast period (cf. also Sections 6 and 8 above for the notation and the corresponding ratios in the net PPE McKinsey model).

Equity values calculated by means of the gross PPE McKinsey model under different scenarios are listed in column (d) of Table A (in Section 13 above). It should be mentioned that the gross PPE McKinsey model results in values of the firm's operating assets Jan. 1 year 12, i. e., at the horizon, identical to those of the net PPE McKinsey model. That is, column (b) is applicable also to the gross PPE McKinsey model. The differences between columns (d) and (a) are hence due to differences in free cash flow only during the explicit forecast period.

One can also define an *exact discounted cash flow model* in the following manner: It is known what capital expenditures have been during six historical years ($-5$ to 0; cf. Table 3). It is also known what gross PPE is in the last historical year (from the last historical balance sheet). If one makes an assumption about PPE economic life (e. g., 10 years), and also assumes that the difference between gross PPE in the last historical year and the known accumulated capital expenditures is accounted for by (for instance) equal capital expenditures in the years prior to the ones for which capital expenditures data are available, then one can generate a complete historical series of capital expenditures summing to gross PPE in the last historical year.[19] All PPE cohorts can then be restated in the last historical year's value of money, using (assumed) inflation rates from previous years.[20]

Furthermore, if one makes the assumption that some value of $K$, real gross PPE divided by revenues, has to hold for each individual year in the explicit forecast and post-horizon periods, then one can generate an *exact* series of capital expenditures for PPE for all future years. This is done by replacing each cohort as its economic life comes to an end, and acquiring additional PPE as called for by the development of real growth. Similarly, one can generate an exact series of deferred income taxes. It has been assumed here that $K$ is equal to 0.58 in the last year of the explicit forecast period, and equal to the immediately preceding historical ratio (with capital expenditures data extended backwards as indicated above) in the first year of that period, with linear interpolation in between. The former value 0.58 has obviously been selected for consistency with the other models.

[19]In the case of McKay, if PPE economic life is 10 years and if capital expenditures during the years $-9$ to $-6$ are 18.3, then gross PPE at the end of year 0 is 297.6, i. e., as indicated by the balance sheet for the last historical year, year 0.

[20]In the McKay example, all historical inflation rates are assumed to have been 3%.

One can hence generate an exact series of free cash flow for every future year, do the discounting, and determine equity value at the date of valuation as a residual, as before.[21] This is an exact model, since it is founded on precise, bottom-up assumptions about capital expenditures and changes in deferred income taxes. Apparently, it requires detailed information about the age structure of PPE and is therefore difficult to set up by an outside analyst who has access only to financial statements of a few recent years. The exact model is intended not as a recommended choice, but as a benchmark for evaluating more approximate model variants, in particular the net PPE McKinsey model as outlined in earlier sections of this tutorial.

Table A contains selected results from the exact model, both equity value Jan. 1 year 1 (column (e)), and the value of the firm's operating assets Jan. 1 year 12 (column (f)). The base case value of equity on Jan. 1 year 1 is seen to be somewhat smaller according to the exact model, as compared to the other models. This is not necessarily a very interesting conclusion. The assumptions underlying the exact model are different from those of the other models. For instance, PPE economic life is assumed to be exactly 10 years throughout, whereas it gradually approaches 10 years in the other models (through the interpolation procedure; it may in fact have been longer in the historical years). What is interesting, however, is to see how computed equity value in the exact model changes as a result of changes in assumed real growth and inflation, and compare those effects to what happens in the other models. That is, it is interesting to compare column (e) in Table A with columns (a), (c), and (d), as regards scenarios 2 - 6.

Consider first scenarios 3 and 4. It is seen that the effects of changes in expected inflation starting year 11 as indicated by the other models *are in the wrong direction*, as compared to what they should be according to the exact model. That is, there should be a fall in computed equity value Jan. 1 year 1, if inflation increases starting year 11, and conversely if inflation falls from that year. However, the other models give opposite results. This is due to the linear interpolation of forecast ratios relating to PPE between the first and last years of the explicit forecast periods. That is, capital expenditures in *intermediate* years change, if inflation changes in the *last* year of the explicit forecast period.

A similar result can be seen in scenario 2, where the gross PPE McKinsey model suggests an equity value increase that is too high. Given that real growth provides almost no extra value, equity value Jan. 1 year 1 should be just about the same under scenarios 1 and 2. This is indeed so for the net PPE McKinsey model and for the net PPE abnormal

[21] The post-horizon period is handled by making explicit forecasts for, say, 100 years and then discounting each year individually, or by a more complex infinite discounting formula that accounts for the precise timing of capital expenditures and additions to deferred income taxes. That is, there is no steady-state assumption as regards PPE.

earnings model (actually, there is a slight decrease in both cases). In scenarios 5 and 6, on the other hand, where assumed inflation changes already at the start of the explicit forecast period, the net PPE McKinsey model, the net PPE abnormal earnings model, and the gross PPE McKinsey model all indicate roughly correct value changes, as compared to the exact model. That is, an increase in inflation leads to a lower equity value, and conversely for an inflation decrease.

Again, it is noted that the disqualification of results from certain sensitivity analyses is due to the particular way that the explicit forecast period has been set up, with linear interpolation of forecast ratios relating to PPE and deferred income taxes. This observation does not necessarily lead to a rejection of that modelling approach. On the contrary, setting the forecast ratios in question equal to easily observable historical ratios in the first year of the explicit forecast period and to steady-state values in the last year of that period, and interpolating in between those years, is a very simple starting point in the absence of better ideas (that would have to be founded on additional information or assumptions). However, it should then be realized that certain sensitivity analyses may provide misleading results, in particular scenarios where expected inflation is changed only at the end of the explicit forecast period.

A second conclusion from the previous discussion is that the net PPE McKinsey model seems preferable to the gross PPE model. That is, it seems preferable to let *net* PPE rather than *gross* be driven by revenues. This follows since Table A indicates that the net PPE McKinsey model provides value changes in response to changes in assumptions that are more in line with those of the exact model. Copeland et al. (2000, p. 242) recommend forecasting net PPE as a percentage of revenues.[22] The previous discussion provides some support for such a recommendation.

Actually, there are two further reasons why letting net rather than gross PPE be driven by revenues seems preferable. In the first place, this is a natural choice if historical financial statements provide net PPE, but not how net PPE is broken down into gross PPE and accumulated depreciation. In the second place, if one imagines a gross PPE abnormal earnings model, then abnormal earnings after the horizon do not necessarily increase year by year in accordance with the assumed nominal growth rate that is valid from the last year of the explicit forecast period. That is, discounting by the Gordon formula in the post-horizon period is then no longer totally valid.

[22] In the first edition of their book, gross PPE was driven by revenues. The same holds true for the first two versions of this tutorial.

## 16 Concluding Remarks

It is now clear that the McKinsey model cannot be viewed as a precise prescription of how to proceed when valuing a company. A similar remark also holds for other valuation models, like the abnormal earnings model. On the contrary, a number of modelling choices must be made when implementing a valuation model. In conclusion, some of those choices will be commented on.

McKay's *excess marketable securities* were assumed to be sold off already during the last historical year, i. e., they were set to zero in all forecast years. This is a convenient assumption for the purpose of valuation, at least for a company with only a moderate portfolio of such securities, and even if there is no actual intention on the part of the company to dispose of that portfolio. The assumed *financing policy* in the McKay example, to use an adjustable book value target for financial strength to attain a target capital structure in market value terms in the first year of the post-horizon period, is only one of several possible choices.

It has been indicated above (Sections 5 - 8) how free cash flow in the post-horizon period can be forecasted in a consistent fashion, through particular settings of forecast ratios relating to PPE and deferred income taxes in the last year of the explicit forecast period. It is not so easy to specify what are *consistent forecast ratios in the earlier years of the explicit forecast period*. This tutorial has suggested the heuristic device of setting those ratios through linear interpolation starting from historical averages at the beginning of the explicit forecast period.

For *discounting in the post-horizon period*, this tutorial has used the Gordon formula. Copeland et al. favor a different approach, a so-called continuing-value formula. They admit that either formula is in a technical sense equivalent to the other. However, applying the Gordon formula (referred to as the free cash flow perpetuity formula by these authors) is tricky, leading to mistakes by many analysts. They claim that "The common error is to incorrectly estimate the level of free cash flow that is consistent with the growth rate you are forecasting" (Copeland et al. 2000, p. 270). The purpose in this tutorial of modelling the forecast ratios relating to PPE in the last year of the explicit forecast period as depending on four parameters $g$ (real growth), $i$ (inflation), $n$ (PPE economic life), and $K$ (capital intensity factor) has been to enable an application of the Gordon formula that is at least reasonably transparent and consistent. The approach in this tutorial is therefore suggested as an interesting alternative to the continuing-value formula that is proposed by Copeland et al.

Yet another possibility is to make explicit forecasts of income statements and balance sheets for a large number of individual years and then discount free cash flow for each year separately. Some reflection on this latter possibility leads to the conclusion, however, that there are actually no less than *three different horizon concepts*, or perhaps more clearly:

horizon years, in firm valuation models. In the first place, there is the first year for which no forecast assumptions (like in Table 8) change from the previous year. In the second place, there is that year that defines the market value weights for equity and interest-bearing debt, i. e., for the capital structure in the WACC. In the third place, there is the last year for which an explicit income statement and balance sheet are forecasted (i. e., infinite discounting of one variety or another, or some other terminal value, is used beyond that year). In the McKay example, all of these three different horizon years are the same and equal to the first year of the post-horizon period (year 12). However, in more general set-ups, these three horizon years need not coincide.

Yet another choice relates to *what model should be used*, the McKinsey model, the abnormal earnings model, or some other model. As a matter of fact, there now exists a variety of models that are similar in that they operate on forecasted income statements and balance sheets. However, what they discount, and at what discount rate, varies from one model to another. For instance, Levin (1998) discusses five distinct such models, of which the McKinsey and abnormal earnings models are but two. He shows that under fairly restrictive conditions, they provide the same computed equity value (cf. also Young et al. 1999). However, in an actual implementation that will necessarily be more or less heuristic, the various models typically give results that do not exactly agree. In other words, the choice of a model may affect the final result.

So there are a number of modelling choices to be made. A fair amount of judgment on the part of the analyst doing the valuation is always required. Hence, firm valuation is more art than exact science. This is, in fact, a statement that has often been made by previous authors writing on this fascinating topic (Copeland et al. 2000, p. 293; Jennergren and Näslund 1996, p. 57).

# Appendix 1: Estimates of $n$ and $K$ Based On Data From Statistics Sweden

In this appendix, data from Statistics Sweden (SCB) will be used to shed light on the economic life of PPE and, in particular, the parameter $K$. As will be recalled from Section 6 above, $K$ is the required real gross PPE divided by (real) revenues in the last year of the explicit forecast period and in the post-horizon period. $K$ hence expresses a physical requirement for gross PPE in the production process.

Statistics Sweden regularly publishes accounting data for Swedish companies. Prior to 1996, these data are based on information from all companies with at least 50 employees; and from 1996, on information from all companies without size limitation. Aggregated income statements and balance sheets are presented for different industries, classified by SNI numbers. (SNI is the Swedish national industrial classification system.) These income statements and balance sheets are on a level of detail that is comparable to that of the McKay company. It is hence possible to use this data base to estimate the ratio [operating expenses/revenues] for different industries, as already indicated in Section 4. One can also obtain estimates of ratios between working capital items and revenues, in different industries, from that data base.

The data that are used in this appendix pertain to the years 1994 - 1998 and are taken from the Statistics Sweden publications *Företagen 1994* (Enterprises 1994), *Företagen 1995* (Enterprises 1995), *Ekonomisk redogörelse för företagen 1996* (Financial Accounts for Enterprises 1996), *Ekonomisk redogörelse för företagen 1997* (Structural Business Statistics 1997), and *Ekonomisk redogörelse för företagen 1998* (Structural Business Statistics 1998). These publications also include descriptions (in English as well as in Swedish) of the data and how they were collected.

The SCB data base does not provide gross PPE and accumulated depreciation separately, only net PPE. Nevertheless, if one can provide exogenous estimates of $g$ and $i$ (the rates of real growth and inflation), then steady state estimates of $n$ (PPE economic life in years) and $K$ can be computed using the following equations (cf. Sections 5 and 6 above):

$$\text{depreciation}_t = (\text{net PPE})_{t-1} \times [\text{depreciation/last year's net PPE}],$$

$$\text{depreciation}_t = (\text{net PPE})_t \times \frac{1}{1+c} \cdot \frac{1}{n} \cdot \frac{1}{1-H},$$

$$\frac{\text{depreciation}_t}{(\text{net PPE})_t} = \frac{1}{1+c} \cdot \frac{1}{n} \cdot \frac{1}{1-\left(\frac{1}{cn} - \frac{1}{(1+c)^n-1}\right)}, \tag{6}$$

$$(\text{net PPE})_t = \text{revenues}_t \times [\text{this year's net PPE/revenues}],$$

$$\frac{(\text{net PPE})_t}{\text{revenues}_t} = M(1-H),$$

$$\frac{(\text{net PPE})_t}{\text{revenues}_t} = \frac{\frac{1+c-(1+c)^{-(n-1)}}{c}}{\frac{1+g-(1+g)^{-(n-1)}}{g}} K \left(1 - \left(\frac{1}{cn} - \frac{1}{(1+c)^n - 1}\right)\right). \tag{7}$$

The left hand side of equation (6) can be observed empirically from the Statistics Sweden data, for a given year $t$ and a given industry (according to SNI number).[23] With $g$ and $i$ and hence $c = (1+g)(1+i) - 1$ given, the PPE economic life $n$ can be found as that integer value of $n$ for which the right hand side of (6) is the closest to the left hand side.

[23] To be more precise: $\text{depreciation}_t$ and $(\text{net PPE})_t$ are given in the data base. Depreciation as given in the data base includes depreciation on non-tangible assets (e. g., goodwill). There is a break-down of net PPE that distinguishes such assets. That part of depreciation that refers to non-tangible assets has been eliminated by assuming that non-tangible assets are written off over 12 years.

**Table C. Estimated $n$ and $K$ using the Statistics Sweden data base**

| SNI no. | Industry | 1994 $n$ | 1995 $n$ | 1996 $n$ | 1997 $n$ | 1998 $n$ | 1994 -98 $n$ | 1994 $K$ | 1995 $K$ | 1996 $K$ | 1997 $K$ | 1998 $K$ | 1994 -98 $K$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01-05 | Agricult., forestry, fishing | 16 | 17 | 16 | 12 | 11 | 14 | 0.56 | 0.48 | 0.67 | 0.52 | 0.55 | 0.55 |
| 10-14 | Mining and quarrying | 12 | 11 | 13 | 13 | 14 | 12 | 1.11 | 1.08 | 1.20 | 1.26 | 1.45 | 1.21 |
| 15-16 | Food, beverages, tobacco | 13 | 14 | 12 | 12 | 13 | 13 | 0.36 | 0.37 | 0.38 | 0.38 | 0.42 | 0.38 |
| 17-19 | Textiles, etc. | 11 | 12 | 12 | 12 | 12 | 12 | 0.36 | 0.34 | 0.36 | 0.35 | 0.38 | 0.36 |
| 20 | Wood and wood products | 13 | 15 | 14 | 15 | 15 | 15 | 0.51 | 0.55 | 0.61 | 0.59 | 0.60 | 0.57 |
| 21 | Pulp and paper products | 23 | 24 | 24 | 21 | 18 | 22 | 1.39 | 1.33 | 1.71 | 1.55 | 1.54 | 1.50 |
| 22 | Publishing and printing | 10 | 10 | 10 | 8 | 8 | 9 | 0.35 | 0.36 | 0.36 | 0.32 | 0.31 | 0.34 |
| 23-24 | Chemicals, petroleum | 14 | 14 | 15 | 14 | 14 | 14 | 0.62 | 0.64 | 0.80 | 0.80 | 0.78 | 0.73 |
| 25 | Rubber and plastic pr. | 11 | 11 | 11 | 10 | 10 | 11 | 0.44 | 0.41 | 0.47 | 0.45 | 0.46 | 0.45 |
| 26 | Non-metallic mineral pr. | 11 | 11 | 11 | 11 | 12 | 11 | 0.47 | 0.44 | 0.47 | 0.46 | 0.46 | 0.46 |
| 27 | Basic metall industries | 14 | 15 | 15 | 16 | 15 | 15 | 0.47 | 0.44 | 0.55 | 0.58 | 0.65 | 0.53 |
| 28 | Fabricated metall pr. | 10 | 11 | 11 | 11 | 12 | 11 | 0.34 | 0.39 | 0.39 | 0.42 | 0.45 | 0.40 |
| 29 | Machinery, equipment | 9 | 9 | 9 | 9 | 8 | 9 | 0.24 | 0.23 | 0.23 | 0.24 | 0.23 | 0.23 |
| 30-33 | Electrical and optical | 8 | 7 | 7 | 6 | 6 | 7 | 0.21 | 0.18 | 0.17 | 0.15 | 0.14 | 0.17 |
| 34-35 | Transport equipment | 12 | 10 | 9 | 10 | 10 | 10 | 0.38 | 0.32 | 0.36 | 0.37 | 0.35 | 0.36 |
| 36-37 | Other manufacturing | 11 | 11 | 12 | 10 | 10 | 11 | 0.33 | 0.29 | 0.30 | 0.30 | 0.29 | 0.30 |
| 40-41 | Electricity, gas, water | 28 | 28 | 28 | 26 | 28 | 27 | 2.63 | 2.27 | 2.47 | 2.59 | 2.75 | 2.53 |
| 45 | Construction | 14 | 14 | 13 | 20 | 20 | 16 | 0.32 | 0.33 | 0.26 | 0.45 | 0.44 | 0.36 |
| 51 | Wholesale trade | 9 | 10 | 10 | 9 | 9 | 9 | 0.10 | 0.10 | 0.11 | 0.10 | 0.10 | 0.10 |
| 52 | Retail trade | 11 | 11 | 11 | 9 | 10 | 10 | 0.13 | 0.13 | 0.13 | 0.11 | 0.11 | 0.12 |
| 55 | Hotels and restaurants | 13 | 14 | 14 | 14 | 13 | 14 | 0.44 | 0.48 | 0.54 | 0.58 | 0.53 | 0.52 |
| 60 | Land transportation | 9 | 9 | 10 | 12 | 13 | 11 | 0.64 | 0.64 | 0.67 | 0.96 | 1.02 | 0.81 |
| 61 | Sea transportation | 21 | 25 | 23 | 24 | 20 | 23 | 1.08 | 1.30 | 1.35 | 1.04 | 0.94 | 1.14 |
| 62 | Air transportation | 17 | 16 | 18 | 19 | 19 | 18 | 0.78 | 0.68 | 0.87 | 0.88 | 0.97 | 0.84 |
| 74 | Other (consulting) | 7 | 7 | 10 | 8 | 9 | 8 | 0.21 | 0.20 | 0.27 | 0.25 | 0.23 | 0.23 |

This estimate of PPE economic life is valid, since the data in the left hand side refer to *the whole industry*, not merely to one company. That is, a single company could, e. g., depreciate over a shorter time period than the economic life, but it is not likely that the whole industry would do that in a given year. With that value of $n$, one then turns to equation (7). The left hand side of (7) can, again, be observed empirically for a given year $t$ and a given industry. $K$ can then be estimated by setting the right hand side of (7) equal to the left hand side. As before, this is a plausible procedure, since the data refer to the totality of companies within one industry: It is more reasonable to imagine that the whole industry is in a steady state than an individual company.[24]

Estimated values of $n$ and $K$ are given in Table C, for a variety of industries. These values are given separately for the years 1994, 1995, 1996, 1997, and 1998, based on data

[24] If $c = 0$, equations (6) and (7) become:

$$\frac{\text{depreciation}_t}{(\text{net PPE})_t} = \frac{1}{n} \cdot \frac{1}{1 - \frac{n-1}{2n}},$$

$$\frac{(\text{net PPE})_t}{\text{revenues}_t} = K\left(1 - \frac{n-1}{2n}\right).$$

from each one of these years. Estimated $n$ and $K$ are also given for the whole period 1994 - 1998, i. e., by pooling these five subsequent years and considering them as one observation. Throughout Table C, the assumed values of $g$ and $i$ are 0.01 and 0.02, respectively.

There are thus six different estimates of $n$ and $K$ for each industry in Table C. It is noted that there is some instability between years in estimated $n$ values for a few industries, for instance construction. There is also some instability as regards estimated $K$ values in a few cases, e. g., land transportation and sea transportation. However, for many industries estimated $n$ and $K$ values are fairly stable. In any case, it seems reasonable to rely mainly on estimates that are based on data aggregated from several years, i. e., the columns marked 1994-98 in Table C. It would of course be interesting to undertake an econometric study using many years of data to see, e. g., if $K$ for a given industry is stable over time. However, such an investigation is outside the scope of this tutorial.

It is an interesting observation that there is a clear differentiation between industries that corresponds reasonably well to common-sense considerations about capital intensity. That is, certain industries, like electricity, gas, and water supply, and pulp and paper products, are very capital-intensive, with long-lived PPE. Others, such as retail trade, and electrical and optical, are seen to be light industries when it comes to requirements for gross PPE.

# Appendix 2: A Note on Payments Associated with Leasing

In a discounted cash flow model, there is a fundamental difference between operations and financing. Free cash flow is cash flow from operations and should not include elements of financial cash flow. However, there are certain cash flow elements that can be classified either as pertaining to operations, or to financing. Capital leases provide a prime example. If one is consistent, the resulting value should of course not depend on that classification, as will be shown in this appendix.

For simplicity, a special situation will be considered: The company is entering into the post-horizon period (i. e., the valuation refers to the start of the first post-horizon year). Also, the company has no interest-bearing debt except capital leases. More precisely, the company's entire net PPE *according to the tax accounting*[25] is financed through capital leases that can be viewed as pertaining either to operations or to financing, and there is no other interest-bearing debt apart from these capital leases. In other words, if the

[25]Net PPE according to the tax accounting is equal to economic life net PPE (i. e., as recorded in the balance sheets) minus timing differences.

leases are viewed as part of operations, then there is no interest-bearing debt at all.

In what follows, the notation introduced in Sections 6 and 12 will be used, together with some additional notation:

$S$ the company's revenues in the last year of the explicit forecast period,
$x$ [operating expenses/revenues] in the post-horizon period,
$w$ the ratio of working capital to revenues in the post-horizon period.

The ratio $w$ of working capital to revenues is apparently equal to the sum of the individual ratios for working capital assets minus the sum of individual ratios for working capital liabilities.[26]

To reiterate, the net PPE according to the tax accounting is financed through capital leases. The nominal amount of the leases (the lease debt) at the end of the last explicit forecast period year is hence $SM(1-H)\left[1-\frac{J}{F_c(1-H)}\right]$ and at the end of the first post-horizon period year $(1+c)SM(1-H)\left[1-\frac{J}{F_c(1-H)}\right]$. The leases can clearly be considered as debt, and the annual lease fee as composed of the two components interest on that debt and repayment of money borrowed. Suppose the borrowing rate inherent in the lease fee is $r_D$. Then the interest component of the lease fee at the end of the first post-horizon year is

$$SM(1-H)\left[1-\frac{J}{F_c(1-H)}\right]r_D. \tag{8}$$

At the same time, i. e., at the end of the first post-horizon year, there is a new lease contract corresponding to the capital expenditures at that point in time, $SM(1-H)\cdot\left[c+\frac{1}{n}\cdot\frac{1}{1-H}\right]$. (The reader is reminded that capital expenditures are equal to this year's net PPE according to economic life minus last year's net PPE plus this year's depreciation.) At the end of the first post-horizon year, the repayment of money borrowed component is hence equal to the difference between the lease debt at the end of the last explicit forecast year and the lease debt at the end of the first post-horizon year plus the new lease borrowing at the end of the first post-horizon year (corresponding to capital expenditures):

$$\begin{aligned}&-cSM(1-H)\left[1-\frac{J}{F_c(1-H)}\right]+SM(1-H)\left[c+\frac{1}{n}\cdot\frac{1}{1-H}\right]\\&=SM(1-H)\left[\frac{1}{n}\cdot\frac{1}{1-H}\right]+cSM(1-H)\left[\frac{J}{F_c(1-H)}\right].\end{aligned} \tag{9}$$

The repayment of money borrowed component is apparently also equal to depreciation over PPE economic life plus change in timing differences. The interpretation is that the money borrowed through the lease contracts is repaid in line with fiscal depreciation.

[26] In the case of McKay, $w$ is equal to 2.0% + 11.3% ... − 6.3% = 7.2% (somewhat rounded).

In other words, the lease fee at the end of the first post-horizon year consists of the two components interest on money borrowed (8) and repayment of money borrowed (9). The lease fee can be viewed as belonging either to the operations or to the financing of the firm.

Suppose initially that the lease contracts are considered as pertaining to the financing of the firm. The company is hence considered as being the owner of the PPE. Consequently, the free cash flow incorporates capital expenditures from acquiring new PPE and tax effects from deducting depreciation. Free cash flow in the first post-horizon year can be written as[27]

$$\left(S(1+c)(1-x) - SM(1-H)\frac{1}{n}\cdot\frac{1}{1-H}\right)(1-\tau) + cSM(1-H)\frac{J}{F_c(1-H)}\tau$$

$$+SM(1-H)\frac{1}{n}\cdot\frac{1}{1-H} - cSw - SM(1-H)\left[c+\frac{1}{n}\cdot\frac{1}{1-H}\right],$$

where the first term is EBIT minus taxes on EBIT, the second term change in deferred income taxes, the third term depreciation added back, the fourth term change in working capital, and the fifth term capital expenditures. Simplifying somewhat, and discounting over an infinite horizon by the WACC to a present value at the start of the first post-horizon year, we obtain the value of the operating assets. That value is equal to the value of the debt $D$ plus the value of the equity $E$. Consequently,

$$D + E =$$

$$\Bigg\{S(1+c)(1-x)(1-\tau) + SM(1-H)\frac{1}{n}\cdot\frac{1}{1-H}\tau + cSM(1-H)\frac{J}{F_c(1-H)}\tau$$

$$-cSw - SM(1-H)\left[c+\frac{1}{n}\cdot\frac{1}{1-H}\right]\Bigg\} \div \left\{\left[r_E\frac{E}{D+E} + r_D(1-\tau)\frac{D}{D+E}\right] - c\right\}. \quad (10)$$

The market value of the debt is assumed equal to its book value. The book value of the debt, in turn, is equal to the nominal amount of the leases, the latter being equal to the net PPE according to the tax accounting.[28] In other words,

$$D = SM(1-H)\left[1 - \frac{J}{F_c(1-H)}\right]. \quad (11)$$

[27]It is assumed that there is no change in the tax rate, and consequently no revaluation of deferred income taxes.

[28]It is apparently not assumed in this example that there is a target capital structure in market value terms of, e. g., 50% equity and 50% interest-bearing debt. Rather, the amount of interest-bearing debt is fixed and equal to the nominal value of the lease contracts, with market value equal to book value. The market value of the equity is then the difference between the value of the assets and the value of the debt.

Solving for $E$ in (10) and then using (11) to substitute for $D$, one obtains the value of the equity as

$$E = \Big\{S(1+c)(1-x)(1-\tau) + SM(1-H)\frac{1}{n}\cdot\frac{1}{1-H}\tau + cSM(1-H)\frac{J}{F_c(1-H)}\tau$$

$$-cSw - SM(1-H)\left[c+\frac{1}{n}\cdot\frac{1}{1-H}\right] - Dr_D(1-\tau) + cD\Big\} \div \{r_E - c\}$$

$$= \Big\{S(1+c)(1-x)(1-\tau) + SM(1-H)\frac{1}{n}\cdot\frac{1}{1-H}\tau + cSM(1-H)\frac{J}{F_c(1-H)}\tau$$

$$-cSw - SM(1-H)\left[c+\frac{1}{n}\cdot\frac{1}{1-H}\right] - SM(1-H)\left[1-\frac{J}{F_c(1-H)}\right]r_D(1-\tau)$$

$$+cSM(1-H)\left[1-\frac{J}{F_c(1-H)}\right]\Big\} \div \{r_E - c\}$$

$$= \Big\{S(1+c)(1-x)(1-\tau) - cSw - SM(1-H)\left[1-\frac{J}{F_c(1-H)}\right]r_D(1-\tau)$$

$$-\left(SM(1-H)\left[\frac{1}{n}\cdot\frac{1}{1-H}\right] + cSM(1-H)\left[\frac{J}{F_c(1-H)}\right]\right)(1-\tau)\Big\} \div \{r_E - c\}\,. \quad (12)$$

There are apparently four terms in the numerator after the last equality sign in (12). The first term consists of the after-tax difference between revenues and operating expenses. The second term is the change in working capital. The third term is the after-tax interest part of the leases, and the fourth term the repayment part of the money borrowed through the leases multiplied by one minus the tax rate.

Suppose now instead that the lease contracts are considered to be part of the operations of the firm. If so, the value of the firm's assets is equal to the value of its equity, since there is no interest-bearing debt. Also, the firm does not undertake any capital expenditures, nor does it obtain any tax deductions due to depreciation. On the other hand, the lease fee, consisting of the two components interest on money borrowed and repayment of money borrowed, is a tax-deductible cash expense that enters into the free cash flow from the firm's operations. Under this interpretation of the lease contracts, the free cash flow to the equity (i. e., the dividends) is precisely equal to the sum of the four terms in the numerator after the last equality sign in (12). Discounting at the required rate of return on equity, the value of the equity at the start of the first post-horizon year is found to be *exactly the same as in equation (12).* It is noted that the required rate of return on equity, $r_E$, does not depend on whether the leases are viewed as belonging to the operations or to the financing. The total risk associated with the equity is the same. It is only the classification of some of that risk, as operational or financing, that changes with the status of the leases.

In conclusion, the status of the leases as pertaining to the operations or the financing of the firm does not affect the valuation result. From an accounting point of view, it may be desirable to show capital leases as explicit debt, and hence consider the company as the owner of the leased pieces of PPE, since that may give a fairer picture of (for instance) the company's ROIC. However, that choice is not important in a discounted cash flow model. What is important is to be consistent. The treatment of leases enters into the valuation in three different places, in the specification of free cash flow, in the determination of the WACC, and in the selection of debt items to deduct from the value of the assets to get the value of the equity as a residual. To treat the leases as operational and then deduct the value of the lease contracts from the asset value in the calculation of equity value as a residual, for instance, would be inconsistent.

The situation is fairly similar for pensions. Pensions are deferred salaries. A company may pay pension contributions immediately (i. e., at the time when the pension rights are earned by the employees) to an outside life insurance company or pension fund. If so, there is no question that these pension contributions pertain to the operations of the firm, being an immediate tax-deductible expense that enters into free cash flow from operations.

However, pension obligations may also remain unfunded, in which case the company must provide pension payments as they fall due (as former employees reach the age of retirement). In this situation, these pension payments may be viewed as part of operations, or as part of financing. In the former case, pension amounts paid out to former employees in effect constitute one component of the total salary bill. In the latter case, the company is regarded as borrowing from its employees. Each employee's claim is compounded forward to the retirement date. The rate of compounding can be viewed as a promised interest rate on the pension debt. Actual pension payments represent amortization of that debt.

The recommendation as regards pensions is hence the same as for leases: It is important to be consistent. Unfortunately, that may not be entirely easy, since the accounting and tax issues surrounding pension plans are typically very complex. Hence, it may be difficult to unravel the cash flow implications of pensions in a complicated set of historical financial statements. The interest rate on pension debt may also be tricky. For instance, in one pension plan simulation undertaken by the author, the implied effective interest rate on the debt was actually lower than the promised rate (the government bond rate), due to pension debt reduction from employees that die before reaching the age of retirement (Jennergren 2000).

# References


[1] Brealey, Richard A., and Stewart C. Myers, 2002. *Principles of Corporate Finance*, 7th ed., McGraw-Hill/Irwin, New York.

[2] Copeland, Tom, Tim Koller, and Jack Murrin, 1990. *Valuation: Measuring and Managing the Value of Companies*, 1st ed., Wiley, New York.

[3] Copeland, Tom, Tim Koller, and Jack Murrin, 1994. *Valuation: Measuring and Managing the Value of Companies*, 2nd ed., Wiley, New York.

[4] Copeland, Tom, Tim Koller, and Jack Murrin, 2000. *Valuation: Measuring and Managing the Value of Companies*, 3rd ed., Wiley, New York.

[5] Howe, Keith M., 1992. Capital Budgeting Discount Rates Under Inflation: A Caveat. *Financial Practice and Education*, Spring/Summer 1992, pp. 31-35.

[6] Jennergren, Peter, 2000. Kommunerna som pensionsförvaltare (Municipalities as Pension Fund Managers, in Swedish), *Ekonomisk Debatt*, Vol. 28, pp. 451-460.

[7] Jennergren, L. Peter, and Bertil Näslund, 1996. The Gimo Corporation Revisited: A Case Study in Firm Valuation. *CEMS Business Review*, Vol. 1, pp. 57-75.

[8] Levin, Joakim, 1998. On the General Equivalence of Company Valuation Models. In: Joakim Levin, *Essays in Company Valuation*, doctoral dissertation, Stockholm School of Economics, pp. 235-333.

[9] Levin, Joakim, and Per Olsson, 1995. Looking Beyond the Horizon and Other Issues in Company Valuation. EFI Research Report, Stockholm School of Economics.

[10] Young, Mike, Peter Sullivan, Ali Nokhasteh, and William Holt, 1999. *All Roads Lead to Rome*, Goldman Sachs Investment Research, London.

# MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS (FILE MCK_1.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | **TABLE 1. HISTORICAL INCOME STATEMENTS** | | | | | | | **TABLE 5. FORECASTED INCOME STATEMENTS** | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| 3 | *Income statement* | *-6* | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 4 | | | | | | | | | | | | | | | | | | | | |
| 5 | Revenues | 197.6 | 222.3 | 272.3 | 299.5 | 350.0 | 418.9 | 505.4 | 598.6 | 690.6 | 768.2 | 846.7 | 924.4 | 999.7 | 1070.9 | 1136.1 | 1193.6 | 1229.4 | 1266.3 | 1304.3 |
| 6 | Operating expenses | -175.4 | -205.8 | -249.6 | -274.7 | -320.5 | -383.6 | -467.4 | -538.8 | -621.5 | -691.4 | -762.0 | -831.9 | -899.7 | -963.8 | -1022.5 | -1074.2 | -1106.5 | -1139.7 | -1173.9 |
| 7 | Depreciation | -12.8 | -9.3 | -11.2 | -13.0 | -15.0 | -17.7 | -26.4 | -28.7 | -32.0 | -36.9 | -41.0 | -45.1 | -49.1 | -53.0 | -56.5 | -59.7 | -62.5 | -64.0 | -64.5 |
| 8 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 9 | Operating income | 9.4 | 7.2 | 11.5 | 11.8 | 14.5 | 17.6 | 11.6 | 31.1 | 37.1 | 39.9 | 43.7 | 47.3 | 50.8 | 54.1 | 57.1 | 59.6 | 60.5 | 62.6 | 65.9 |
| 10 | Interest income * | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.7 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | Interest expense | -0.1 | -0.4 | -0.8 | -1.0 | -3.4 | -4.1 | -10.1 | -10.4 | -10.4 | -11.7 | -12.3 | -13.3 | -14.3 | -15.2 | -16.0 | -16.8 | -17.3 | -17.5 | -17.8 |
| 12 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 13 | Earnings before taxes | 9.3 | 6.8 | 10.7 | 10.8 | 12.0 | 14.2 | 2.1 | 20.7 | 26.6 | 28.2 | 31.4 | 34.0 | 36.5 | 38.9 | 41.0 | 42.9 | 43.2 | 45.1 | 48.1 |
| 14 | Revaluation of deferred | | | | | | | | | | | | | | | | | | | |
| 15 | income taxes | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | Income taxes | -3.3 | -2.4 | -3.8 | -4.2 | -5.0 | -6.1 | -0.7 | -8.1 | -10.4 | -11.0 | -12.2 | -13.3 | -14.3 | -15.2 | -16.0 | -16.7 | -16.8 | -17.6 | -18.8 |
| 17 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 18 | Net income | 6.0 | 4.4 | 6.9 | 6.6 | 7.0 | 8.1 | 1.4 | 12.6 | 16.2 | 17.2 | 19.1 | 20.8 | 22.3 | 23.7 | 25.0 | 26.1 | 26.3 | 27.5 | 29.4 |
| 19 | | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== |
| 20 | | | | | | | | | | | | | | | | | | | | |
| 21 | *Statement of retained* | | | | | | | | | | | | | | | | | | | |
| 22 | *earnings* | *-6* | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 23 | | | | | | | | | | | | | | | | | | | | |
| 24 | Beginning retained | | | | | | | | | | | | | | | | | | | |
| 25 | earnings | | 62.5 | 63.7 | 65.8 | 68.6 | 69.8 | 74.0 | 72.5 | 85.1 | 101.4 | 118.6 | 131.0 | 142.1 | 152.3 | 161.3 | 168.9 | 174.8 | 176.8 | 178.7 |
| 26 | Net income | | 4.4 | 6.9 | 6.6 | 7.0 | 8.1 | 1.4 | 12.6 | 16.2 | 17.2 | 19.1 | 20.8 | 22.3 | 23.7 | 25.0 | 26.1 | 26.3 | 27.5 | 29.4 |
| 27 | Common dividends | | -3.2 | -4.8 | -3.8 | -5.8 | -3.9 | -2.9 | 0.0 | 0.0 | 0.0 | -6.7 | -9.7 | -12.1 | -14.7 | -17.5 | -20.3 | -24.3 | -25.5 | -23.3 |
| 28 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 29 | Ending retained earnings | 62.5 | 63.7 | 65.8 | 68.6 | 69.8 | 74.0 | 72.5 | 85.1 | 101.4 | 118.6 | 131.0 | 142.1 | 152.3 | 161.3 | 168.9 | 174.8 | 176.8 | 178.7 | 184.8 |
| 30 | | | | | | | | | | | | | | | | | | | | |
| 31 | * direct forecast | | | | | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | | | | | | |
| 33 | | **TABLE 2. HISTORICAL BALANCE SHEETS** | | | | | | | **TABLE 6. FORECASTED BALANCE SHEETS** | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | | | | | | | | |
| 35 | | *-6* | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 36 | | | | | | | | | | | | | | | | | | | | |
| 37 | Operating cash | 4.0 | 4.4 | 5.4 | 6.0 | 6.0 | 8.4 | 10.1 | 11.7 | 13.5 | 15.0 | 16.6 | 18.1 | 19.6 | 21.0 | 22.2 | 23.4 | 24.1 | 24.8 | 25.5 |
| 38 | Excess marketable | | | | | | | | | | | | | | | | | | | |
| 39 | securities * | 10.9 | 3.0 | 20.5 | 10.3 | 0.0 | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 40 | Trade receivables | 17.9 | 24.4 | 33.0 | 33.3 | 43.9 | 49.8 | 57.7 | 67.7 | 78.1 | 86.8 | 95.7 | 104.5 | 113.0 | 121.0 | 128.4 | 134.9 | 139.0 | 143.1 | 147.4 |
| 41 | Other receivables | 1.5 | 2.0 | 2.7 | 2.7 | 6.2 | 4.9 | 5.7 | 6.5 | 7.5 | 8.4 | 9.2 | 10.1 | 10.9 | 11.7 | 12.4 | 13.0 | 13.4 | 13.8 | 14.2 |
| 42 | Inventories | 1.9 | 2.1 | 2.8 | 2.5 | 9.0 | 10.9 | 11.9 | 9.7 | 11.1 | 12.4 | 13.7 | 14.9 | 16.1 | 17.3 | 18.3 | 19.3 | 19.8 | 20.4 | 21.0 |
| 43 | Prepaid expenses | 4.3 | 5.1 | 5.3 | 6.0 | 2.4 | 4.4 | 5.0 | 9.5 | 11.0 | 12.2 | 13.5 | 14.7 | 15.9 | 17.1 | 18.1 | 19.0 | 19.6 | 20.2 | 20.8 |
| 44 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 45 | Current assets | 40.5 | 41.0 | 69.7 | 60.8 | 67.5 | 84.2 | 90.4 | 105.1 | 121.2 | 134.9 | 148.6 | 162.3 | 175.5 | 188.0 | 199.5 | 209.5 | 215.8 | 222.3 | 229.0 |
| 46 | | | | | | | | | | | | | | | | | | | | |
| 47 | Gross property, | | | | | | | | | | | | | | | | | | | |
| 48 | plant and equipment | 100.0 | 117.7 | 128.2 | 155.6 | 204.7 | 272.5 | 297.6 | 334.2 | 381.1 | 422.7 | 463.5 | 502.6 | 539.1 | 572.1 | 600.7 | 624.1 | 638.1 | 649.5 | 668.8 |
| 49 | Accumulated depreciation | -37.7 | -42.3 | -48.7 | -56.5 | -71.9 | -86.9 | -103.4 | -121.8 | -140.4 | -159.7 | -178.9 | -197.6 | -215.4 | -232.0 | -246.9 | -259.9 | -270.7 | -278.8 | -287.1 |
| 50 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |

# MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS (FILE MCK_1.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | Net property, plant | | | | | | | | | | | | | | | | | | | |
| 52 | and equipment | 62.3 | 75.4 | 79.5 | 99.1 | 132.8 | 185.6 | 194.2 | 212.4 | 240.8 | 263.1 | 284.7 | 305.0 | 323.7 | 340.1 | 353.7 | 364.2 | 367.5 | 370.6 | 381.7 |
| 53 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 54 | Total assets | 102.8 | 116.4 | 149.2 | 159.9 | 200.3 | 269.8 | 284.6 | 317.5 | 362.0 | 397.9 | 433.3 | 467.3 | 499.2 | 528.1 | 553.2 | 573.7 | 583.3 | 592.9 | 610.7 |
| 55 | | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== |
| 56 | | | | | | | | | | | | | | | | | | | | |
| 57 | Short-term debt | 0.3 | 0.8 | 0.9 | 1.5 | 11.5 | 12.5 | 20.7 | 19.0 | 19.4 | 22.1 | 22.9 | 25.0 | 26.8 | 28.5 | 30.0 | 31.2 | 32.2 | 32.5 | 33.0 |
| 58 | Accounts payable | 7.3 | 11.0 | 11.9 | 10.5 | 14.2 | 16.2 | 18.9 | 24.1 | 27.8 | 30.9 | 34.1 | 37.2 | 40.2 | 43.1 | 45.7 | 48.1 | 49.5 | 51.0 | 52.5 |
| 59 | Other current liabilities | 13.9 | 13.5 | 18.2 | 18.5 | 21.4 | 27.8 | 28.8 | 38.0 | 43.8 | 48.7 | 53.7 | 58.7 | 63.4 | 68.0 | 72.1 | 75.7 | 78.0 | 80.4 | 82.8 |
| 60 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 61 | Total current liabilities | 21.5 | 25.3 | 31.0 | 30.5 | 47.1 | 56.5 | 68.4 | 81.0 | 91.0 | 101.8 | 110.7 | 120.8 | 130.5 | 139.5 | 147.8 | 155.0 | 159.7 | 163.9 | 168.2 |
| 62 | | | | | | | | | | | | | | | | | | | | |
| 63 | Long-term debt | 5.5 | 11.5 | 16.2 | 21.7 | 40.2 | 90.6 | 94.8 | 97.0 | 110.6 | 114.7 | 124.8 | 133.9 | 142.3 | 149.8 | 156.2 | 161.2 | 162.7 | 164.9 | 170.3 |
| 64 | | | | | | | | | | | | | | | | | | | | |
| 65 | Deferred income taxes | 8.7 | 11.0 | 12.6 | 15.5 | 19.6 | 25.1 | 25.3 | 30.8 | 35.4 | 39.3 | 43.1 | 46.9 | 50.5 | 53.8 | 56.7 | 59.2 | 60.5 | 61.9 | 63.7 |
| 66 | | | | | | | | | | | | | | | | | | | | |
| 67 | Common stock * | 4.6 | 4.9 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| 68 | Retained earnings | 62.5 | 63.7 | 65.8 | 68.6 | 69.8 | 74.0 | 72.5 | 85.1 | 101.4 | 118.6 | 131.0 | 142.1 | 152.3 | 161.3 | 168.9 | 174.8 | 176.8 | 178.7 | 184.8 |
| 69 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 70 | Total common equity | 67.1 | 68.6 | 89.4 | 92.2 | 93.4 | 97.6 | 96.1 | 108.7 | 125.0 | 142.2 | 154.6 | 165.7 | 175.9 | 184.9 | 192.5 | 198.4 | 200.4 | 202.3 | 208.4 |
| 71 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 72 | Total liabilities and equity | 102.8 | 116.4 | 149.2 | 159.9 | 200.3 | 269.8 | 284.6 | 317.5 | 362.0 | 397.9 | 433.3 | 467.3 | 499.2 | 528.1 | 553.2 | 573.7 | 583.3 | 592.9 | 610.7 |
| 73 | | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== |
| 74 | | | | | | | | | | | | | | | | | | | | |
| 75 | Invested capital | 70.7 | 88.9 | 98.6 | 120.6 | 164.7 | 220.0 | 236.9 | 255.4 | 290.4 | 318.3 | 345.5 | 371.5 | 395.5 | 417.0 | 435.3 | 449.9 | 455.8 | 461.6 | 475.5 |
| 76 | Debt/invested capital | 8.2% | 13.8% | 17.3% | 19.2% | 31.4% | 46.9% | 48.8% | 45.4% | 44.8% | 43.0% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% |
| 77 | NOPLAT/invested capital | | | | | | | | | | | | | | | | | | | |
| 78 | (ROIC) | | 8.7% | 9.6% | 9.2% | 8.9% | 8.1% | 3.2% | 9.9% | 10.0% | 9.3% | 9.2% | 9.1% | 9.0% | 8.9% | 8.9% | 8.8% | 8.4% | 8.6% | 9.0% |
| 79 | | | | | | | | | | | | | | | | | | | | |
| 80 | * direct forecast | | | | | | | | | | | | | | | | | | | |
| 81 | | | | | | | | | | | | | | | | | | | | |
| 82 | | **TABLE 3. HISTORICAL FREE CASH FLOW** | | | | | | | **TABLE 7. FORECASTED FREE CASH FLOW** | | | | | | | | | | | |
| 83 | | | | | | | | | | | | | | | | | | | | |
| 84 | *Free cash flow* | | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 85 | | | | | | | | | | | | | | | | | | | | |
| 86 | Revenues | | 222.3 | 272.3 | 299.5 | 350.0 | 418.9 | 505.4 | 598.6 | 690.6 | 768.2 | 846.7 | 924.4 | 999.7 | 1070.9 | 1136.1 | 1193.6 | 1229.4 | 1266.3 | 1304.3 |
| 87 | Operating expenses | | -205.8 | -249.6 | -274.7 | -320.5 | -383.6 | -467.4 | -538.8 | -621.5 | -691.4 | -762.0 | -831.9 | -899.7 | -963.8 | -1022.5 | -1074.2 | -1106.5 | -1139.7 | -1173.9 |
| 88 | Depreciation | | -9.3 | -11.2 | -13.0 | -15.0 | -17.7 | -26.4 | -28.7 | -32.0 | -36.9 | -41.0 | -45.1 | -49.1 | -53.0 | -56.5 | -59.7 | -62.5 | -64.0 | -64.5 |
| 89 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 90 | EBIT | | 7.2 | 11.5 | 11.8 | 14.5 | 17.6 | 11.6 | 31.1 | 37.1 | 39.9 | 43.7 | 47.3 | 50.8 | 54.1 | 57.1 | 59.6 | 60.5 | 62.6 | 65.9 |
| 91 | Taxes on EBIT | | -2.6 | -4.1 | -4.6 | -6.0 | -7.4 | -4.4 | -12.1 | -14.5 | -15.6 | -17.0 | -18.5 | -19.8 | -21.1 | -22.3 | -23.3 | -23.6 | -24.4 | -25.7 |
| 92 | Revaluation of deferred | | | | | | | | | | | | | | | | | | | |
| 93 | income taxes | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 94 | Change in deferred | | | | | | | | | | | | | | | | | | | |
| 95 | income taxes | | 2.3 | 1.6 | 2.9 | 4.1 | 5.5 | 0.2 | 5.5 | 4.6 | 3.9 | 3.9 | 3.8 | 3.6 | 3.3 | 2.9 | 2.5 | 1.3 | 1.3 | 1.9 |
| 96 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 97 | NOPLAT | | 6.9 | 9.0 | 10.1 | 12.6 | 15.7 | 7.4 | 24.4 | 27.2 | 28.2 | 30.5 | 32.6 | 34.6 | 36.3 | 37.7 | 38.9 | 38.2 | 39.6 | 42.1 |
| 98 | Add back depreciation | | 9.3 | 11.2 | 13.0 | 15.0 | 17.7 | 26.4 | 28.7 | 32.0 | 36.9 | 41.0 | 45.1 | 49.1 | 53.0 | 56.5 | 59.7 | 62.5 | 64.0 | 64.5 |
| 99 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 100 | Gross cash flow | | 16.2 | 20.2 | 23.1 | 27.6 | 33.4 | 33.8 | 53.2 | 59.2 | 65.1 | 71.5 | 77.7 | 83.7 | 89.3 | 94.3 | 98.6 | 100.7 | 103.5 | 106.6 |

# MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS (FILE MCK_1.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | | | | | | | | | | | | | | | | | | | | |
| 102 | Change in working | | | | | | | | | | | | | | | | | | | |
| 103 | capital (+ if increase) | | 5.1 | 5.6 | 2.4 | 10.4 | 2.5 | 8.3 | 0.3 | 6.6 | 5.6 | 5.6 | 5.6 | 5.4 | 5.1 | 4.7 | 4.1 | 2.6 | 2.6 | 2.7 |
| 104 | Capital expenditures | | | | | | | | | | | | | | | | | | | |
| 105 | (+ if positive) | | 22.4 | 15.3 | 32.6 | 48.7 | 70.5 | 35.0 | 47.0 | 60.3 | 59.2 | 62.6 | 65.5 | 67.8 | 69.4 | 70.2 | 70.2 | 65.7 | 67.1 | 75.6 |
| 106 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 107 | Gross investment | | 27.5 | 20.9 | 35.0 | 59.1 | 73.0 | 43.3 | 47.3 | 66.9 | 64.8 | 68.2 | 71.1 | 73.2 | 74.5 | 74.9 | 74.3 | 68.3 | 69.8 | 78.4 |
| 108 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 109 | Free cash flow | | -11.3 | -0.7 | -11.9 | -31.5 | -39.6 | -9.5 | 5.9 | -7.7 | 0.3 | 3.3 | 6.7 | 10.5 | 14.8 | 19.4 | 24.2 | 32.4 | 33.8 | 28.2 |
| 110 | | | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== |
| 111 | | | | | | | | | | | | | | | | | | | | |
| 112 | *Financial cash flow* | | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 113 | | | | | | | | | | | | | | | | | | | | |
| 114 | Incr(+)/Decr(-) in excess | | | | | | | | | | | | | | | | | | | |
| 115 | marketable securities | | -7.9 | 17.5 | -10.2 | -10.3 | 5.8 | -5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 116 | After-tax interest | | | | | | | | | | | | | | | | | | | |
| 117 | income (-) | | 0.0 | 0.0 | 0.0 | -0.5 | -0.4 | -0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 118 | Incr(-)/Decr(+) in short- | | | | | | | | | | | | | | | | | | | |
| 119 | and long-term debt | | -6.5 | -4.8 | -6.1 | -28.5 | -51.4 | -12.4 | -0.4 | -14.1 | -6.8 | -10.9 | -11.1 | -10.3 | -9.2 | -7.8 | -6.2 | -2.5 | -2.5 | -5.9 |
| 120 | After-tax interest | | | | | | | | | | | | | | | | | | | |
| 121 | expense (+) | | 0.2 | 0.5 | 0.6 | 2.1 | 2.5 | 6.2 | 6.3 | 6.4 | 7.1 | 7.5 | 8.1 | 8.7 | 9.3 | 9.8 | 10.2 | 10.6 | 10.7 | 10.8 |
| 122 | Common dividends (+) | | 3.2 | 4.8 | 3.8 | 5.8 | 3.9 | 2.9 | 0.0 | 0.0 | 0.0 | 6.7 | 9.7 | 12.1 | 14.7 | 17.5 | 20.3 | 24.3 | 25.5 | 23.3 |
| 123 | Incr(-)/Decr(+) in | | | | | | | | | | | | | | | | | | | |
| 124 | common stock | | -0.3 | -18.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 125 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 126 | Financial cash flow | | -11.3 | -0.7 | -11.9 | -31.5 | -39.6 | -9.5 | 5.9 | -7.7 | 0.3 | 3.3 | 6.7 | 10.5 | 14.8 | 19.4 | 24.2 | 32.4 | 33.8 | 28.2 |
| 127 | | | | | | | | | | | | | | | | | | | | |
| 128 | Effective tax rate on EBIT | | 3.6% | 21.8% | 14.3% | 12.9% | 10.9% | 36.3% | 21.5% | 26.5% | 29.3% | 30.2% | 31.0% | 32.0% | 32.9% | 33.8% | 34.8% | 36.8% | 36.9% | 36.2% |
| 129 | | | | | | | | | | | | | | | | | | | | |
| 130 | | **TABLE 4. HISTORICAL RATIOS FOR FORECAST ASSUMPTIONS** | | | | | | | **TABLE 8. FORECAST ASSUMPTIONS** | | | | | | | | | | | |
| 131 | | | | | | | | | | | | | | | | | | | | |
| 132 | | *-6* | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 133 | | | | | | | | | | | | | | | | | | | | |
| 134 | Operations | | | | | | | | | | | | | | | | | | | |
| 135 | Real growth (*g* ) | | | | | | | | 15.0% | 12.0% | 8.0% | 7.0% | 6.0% | 5.0% | 4.0% | 3.0% | 2.0% | 0.0% | 0.0% | 0.0% |
| 136 | Inflation (*i* ) | | | | | | | | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% |
| 137 | Revenue growth (*c* ) | | 12.5% | 22.5% | 10.0% | 16.9% | 19.7% | 20.6% | 18.5% | 15.4% | 11.2% | 10.2% | 9.2% | 8.2% | 7.1% | 6.1% | 5.1% | 3.0% | 3.0% | 3.0% |
| 138 | Operating expenses/ | | | | | | | | | | | | | | | | | | | |
| 139 | revenues | 88.8% | 92.6% | 91.7% | 91.7% | 91.6% | 91.6% | 92.5% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% |
| 140 | | | | | | | | | | | | | | | | | | | | |
| 141 | Working cap/revenues | | | | | | | | | | | | | | | | | | | |
| 142 | Operating cash/revenues | 2.0% | 2.0% | 2.0% | 2.0% | 1.7% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| 143 | Trade receiv's/revenues | 9.1% | 11.0% | 12.1% | 11.1% | 12.5% | 11.9% | 11.4% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% |
| 144 | Other receiv's/revenues | 0.8% | 0.9% | 1.0% | 0.9% | 1.8% | 1.2% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% |
| 145 | Inventories/revenues | 1.0% | 0.9% | 1.0% | 0.8% | 2.6% | 2.6% | 2.4% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% |
| 146 | Prepaid exp's/revenues | 2.2% | 2.3% | 1.9% | 2.0% | 0.7% | 1.1% | 1.0% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% |
| 147 | Accounts payable/rev's | 3.7% | 4.9% | 4.4% | 3.5% | 4.1% | 3.9% | 3.7% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% |
| 148 | Other curr liab's/rev's | 7.0% | 6.1% | 6.7% | 6.2% | 6.1% | 6.6% | 5.7% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% |
| 149 | | | | | | | | | | | | | | | | | | | | |
| 150 | Property, Plant and | | | | | | | | | | | | | | | | | | | |

# MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS (FILE MCK_1.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 151 | Equipment (PPE) | | | | | | | | | | | | | | | | | | | |
| 152 | PPE economic life (*n*) | | | | | | | | | | | | | | | | | | 10 | |
| 153 | *F* _sub_*g* (see Sect 6) | | | | | | | | | | | | | | | | | | 10.0000 | |
| 154 | *F* _sub_*c* (see Sect 6) | | | | | | | | | | | | | | | | | | 8.7861 | |
| 155 | Real PPE/rev's (*K*) | | | | | | | | | | | | | | | | | | 0.580 | |
| 156 | *M* (see Section 6) | | | | | | | | | | | | | | | | | | 0.510 | |
| 157 | *H* (see Section 6) | | | | | | | | | | | | | | | | | | 0.426 | |
| 158 | Net PPE/revenues | 31.5% | 33.9% | 29.2% | 33.1% | 37.9% | 44.3% | 38.4% | 35.5% | 34.9% | 34.2% | 33.6% | 33.0% | 32.4% | 31.8% | 31.1% | 30.5% | 29.9% | 29.3% | 29.3% |
| 159 | Depreciation/net PPE * | | 14.9% | 14.9% | 16.4% | 15.1% | 13.3% | 14.2% | 14.8% | 15.1% | 15.3% | 15.6% | 15.8% | 16.1% | 16.4% | 16.6% | 16.9% | 17.2% | 17.4% | 17.4% |
| 160 | Retirements/net PPE * | | 7.5% | 6.4% | 6.5% | -0.4% | 2.0% | 5.3% | 5.3% | 6.3% | 7.3% | 8.3% | 9.3% | 10.3% | 11.2% | 12.2% | 13.2% | 14.2% | 15.2% | 15.2% |
| 161 | | | | | | | | | | | | | | | | | | | | |
| 162 | Taxes | | | | | | | | | | | | | | | | | | | |
| 163 | Tax rate | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% |
| 164 | PPE tax life (*q*) | | | | | | | | | | | | | | | | | | 5 | |
| 165 | *J* (see Section 8) | | | | | | | | | | | | | | | | | | 2.160 | |
| 166 | Timing diff's/net PPE | 35.8% | 37.4% | 40.6% | 40.1% | 37.8% | 34.7% | 33.4% | 37.1% | 37.7% | 38.3% | 38.8% | 39.4% | 40.0% | 40.5% | 41.1% | 41.7% | 42.2% | 42.8% | 42.8% |
| 167 | | | | | | | | | | | | | | | | | | | | |
| 168 | Interest rate items | | | | | | | | | | | | | | | | | | | |
| 169 | Real borrowing rate | | | | | | | | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% |
| 170 | Nominal borrowing rate | | | | | | | | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% |
| 171 | Real cost of equity | | | | | | | | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% |
| 172 | Nominal cost of equity | | | | | | | | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% |
| 173 | | | | | | | | | | | | | | | | | | | | |
| 174 | Book value target for | | | | | | | | | | | | | | | | | | | |
| 175 | financial strength | | | | | | | | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% |
| 176 | | | | | | | | | | | | | | | | | | | | |
| 177 | This year's short-term/last | | | | | | | | | | | | | | | | | | | |
| 178 | year's long-term debt | | | | | | | | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% |
| 179 | | | | | | | | | | | | | | | | | | | | |
| 180 | * last year's net PPE | | | | | | | | | | | | | | | | | | | |
| 181 | | | | | | | | | | | | | | | | | | | | |
| 182 | | | | | | | | | **VALUE CALCULATIONS** | | | | | | | | | | | |
| 183 | | | | | | | | | | | | | | | | | | | | |
| 184 | | | | | | | | | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 185 | | | | | | | | | | | | | | | | | | | | |
| 186 | *1. Free Cash Flow* | | | | | | | | | | | | | | | | | | | |
| 187 | | | | | | | | | | | | | | | | | | | | |
| 188 | Excess marketable | | | | | | | | | | | | | | | | | | | |
| 189 | securities (at year start) | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 190 | Interest-bearing debt | | | | | | | | | | | | | | | | | | | |
| 191 | (at year start) | | | | | | | | 115.5 | 115.9 | 130.0 | 136.8 | 147.7 | 158.8 | 169.1 | 178.3 | 186.2 | 192.4 | 194.9 | 197.4 |
| 192 | Free cash fl (at year end) | | | | | | | | 5.9 | -7.7 | 0.3 | 3.3 | 6.7 | 10.5 | 14.8 | 19.4 | 24.2 | 32.4 | 33.8 | 28.2 |
| 193 | WACC | | | | | | | | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% |
| 194 | Computed value of oper | | | | | | | | | | | | | | | | | | | |
| 195 | assets (at year start) | | | | | | | | 198.5 | 212.8 | 242.0 | 266.2 | 290.0 | 312.7 | 333.9 | 353.0 | 369.4 | 382.6 | 389.1 | 394.8 |
| 196 | Computed equity value (at | | | | | | | | | | | | | | | | | | | |
| 197 | year start; including | | | | | | | | | | | | | | | | | | | |
| 198 | deferred taxes) | | | | | | | | 83.0 | 96.8 | 112.0 | 129.4 | 142.3 | 153.9 | 164.8 | 174.7 | 183.2 | 190.2 | 194.2 | 197.4 |
| 199 | | | | | | | | | | | | | | | | | | | | |
| 200 | Desired E/(D+E) year 12 | | | | | | | | 50.0% | | | | | | | | | | | |

## MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS (FILE MCK_1.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | Result E/(D+E) year 12 | | | | | | | | 50.0% | | | | | | | | | | | |
| 202 | Result E/(D+E) all years | | | | | | | | 41.8% | 45.5% | 46.3% | 48.6% | 49.1% | 49.2% | 49.4% | 49.5% | 49.6% | 49.7% | 49.9% | 50.0% |
| 203 | Drive to 0 by Goal Seek | | | | | | | | | | | | | | | | | | | |
| 204 | (vary year 1 Book value | | | | | | | | | | | | | | | | | | | |
| 205 | target for financial | | | | | | | | | | | | | | | | | | | |
| 206 | strength (I175)!) | | | | | | | | | | | | | | | | | | | |
| 207 | | | | | | | | | | | | | | | | | | | | |
| 208 | *2. Abnormal Earnings* | | | | | | | | | | | | | | | | | | | |
| 209 | | | | | | | | | | | | | | | | | | | | |
| 210 | Interest-bearing debt | | | | | | | | | | | | | | | | | | | |
| 211 | (at year start) | | | | | | | | 115.5 | 115.9 | 130.0 | 136.8 | 147.7 | 158.8 | 169.1 | 178.3 | 186.2 | 192.4 | 194.9 | 197.4 |
| 212 | Book equity value | | | | | | | | | | | | | | | | | | | |
| 213 | (at year start) | | | | | | | | 96.1 | 108.7 | 125.0 | 142.2 | 154.6 | 165.7 | 175.9 | 184.9 | 192.5 | 198.4 | 200.4 | 202.3 |
| 214 | Net income (at year end) | | | | | | | | 12.6 | 16.2 | 17.2 | 19.1 | 20.8 | 22.3 | 23.7 | 25.0 | 26.1 | 26.3 | 27.5 | 29.4 |
| 215 | Cost of equity | | | | | | | | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% |
| 216 | Abnormal earnings | | | | | | | | -1.6 | 0.1 | -1.3 | -1.9 | -2.1 | -2.2 | -2.3 | -2.4 | -2.3 | -3.0 | -2.1 | -0.6 |
| 217 | Computed equity value | | | | | | | | | | | | | | | | | | | |
| 218 | (at year start) | | | | | | | | 86.2 | 98.9 | 113.6 | 130.4 | 143.0 | 154.5 | 165.3 | 175.0 | 183.5 | 190.3 | 194.2 | 197.4 |
| 219 | | | | | | | | | | | | | | | | | | | | |
| 220 | Desired E/(D+E) year 12 | | | | | | | | 50.0% | | | | | | | | | | | |
| 221 | Result E/(D+E) year 12 | | | | | | | | 50.0% | | | | | | | | | | | |
| 222 | Result E/(D+E) all years | | | | | | | | 42.7% | 46.0% | 46.6% | 48.8% | 49.2% | 49.3% | 49.4% | 49.5% | 49.6% | 49.7% | 49.9% | 50.0% |
| 223 | Drive to 0 by Goal Seek | | | | | | | | | | | | | | | | | | | |
| 224 | (vary year 1 Book value | | | | | | | | | | | | | | | | | | | |
| 225 | target for financial | | | | | | | | | | | | | | | | | | | |
| 226 | strength (I175)!) | | | | | | | | | | | | | | | | | | | |

# MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS, ALTERNATIVE TAX ACCOUNTING SYSTEM (FILE MCK_1B.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | **TABLE 1. HISTORICAL INCOME STATEMENTS** | | | | | | | **TABLE 5. FORECASTED INCOME STATEMENTS** | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | |
| 3 | *Income statement* | *-6* | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 4 | | | | | | | | | | | | | | | | | | | | |
| 5 | Revenues | 197.6 | 222.3 | 272.3 | 299.5 | 350.0 | 418.9 | 505.4 | 598.6 | 690.6 | 768.2 | 846.7 | 924.4 | 999.7 | 1070.9 | 1136.1 | 1193.6 | 1229.4 | 1266.3 | 1304.3 |
| 6 | Operating expenses | -175.4 | -205.8 | -249.6 | -274.7 | -320.5 | -383.6 | -467.4 | -538.8 | -621.5 | -691.4 | -762.0 | -831.9 | -899.7 | -963.8 | -1022.5 | -1074.2 | -1106.5 | -1139.7 | -1173.9 |
| 7 | Depreciation | -12.8 | -9.3 | -11.2 | -13.0 | -15.0 | -17.7 | -26.4 | -28.7 | -32.0 | -36.9 | -41.0 | -45.1 | -49.1 | -53.0 | -56.5 | -59.7 | -62.5 | -64.0 | -64.5 |
| 8 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 9 | Operating income | 9.4 | 7.2 | 11.5 | 11.8 | 14.5 | 17.6 | 11.6 | 31.1 | 37.1 | 39.9 | 43.7 | 47.3 | 50.8 | 54.1 | 57.1 | 59.6 | 60.5 | 62.6 | 65.9 |
| 10 | Interest income * | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 0.7 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | Interest expense | -0.1 | -0.4 | -0.8 | -1.0 | -3.4 | -4.1 | -10.1 | -10.4 | -10.4 | -11.7 | -12.3 | -13.3 | -14.3 | -15.2 | -16.0 | -16.8 | -17.3 | -17.5 | -17.8 |
| 12 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 13 | Earnings after interest | | | | | | | | | | | | | | | | | | | |
| 14 | income and expense | 9.3 | 6.8 | 10.7 | 10.8 | 12.0 | 14.2 | 2.1 | 20.7 | 26.6 | 28.2 | 31.4 | 34.0 | 36.5 | 38.9 | 41.0 | 42.9 | 43.2 | 45.1 | 48.1 |
| 15 | | | | | | | | | | | | | | | | | | | | |
| 16 | Increase(-)/Decrease(+) | | | | | | | | | | | | | | | | | | | |
| 17 | in timing differences | | -5.9 | -4.1 | -7.4 | -10.5 | -14.1 | -0.5 | -14.0 | -11.9 | -9.9 | -9.9 | -9.6 | -9.2 | -8.5 | -7.5 | -6.4 | -3.5 | -3.4 | -4.8 |
| 18 | | | | | | | | | | | | | | | | | | | | |
| 19 | Income taxes | | -0.1 | -2.2 | -1.3 | -0.9 | -0.6 | -0.5 | -2.6 | -5.7 | -7.1 | -8.4 | -9.5 | -10.7 | -11.9 | -13.1 | -14.2 | -15.5 | -16.3 | -16.9 |
| 20 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 21 | Net income | | 0.8 | 4.4 | 2.1 | 0.6 | -0.5 | 1.1 | 4.1 | 9.0 | 11.2 | 13.1 | 14.9 | 16.7 | 18.5 | 20.4 | 22.3 | 24.2 | 25.4 | 26.5 |
| 22 | | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== |
| 23 | | | | | | | | | | | | | | | | | | | | |
| 24 | *Statement of retained* | | | | | | | | | | | | | | | | | | | |
| 25 | *earnings* | *-6* | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 26 | | | | | | | | | | | | | | | | | | | | |
| 27 | Beginning retained | | | | | | | | | | | | | | | | | | | |
| 28 | earnings | | 48.9 | 46.5 | 46.1 | 44.4 | 39.1 | 34.7 | 32.9 | 37.0 | 46.0 | 57.2 | 63.6 | 68.8 | 73.4 | 77.2 | 80.2 | 82.2 | 82.1 | 82.0 |
| 29 | Net income | | 0.8 | 4.4 | 2.1 | 0.6 | -0.5 | 1.1 | 4.1 | 9.0 | 11.2 | 13.1 | 14.9 | 16.7 | 18.5 | 20.4 | 22.3 | 24.2 | 25.4 | 26.5 |
| 30 | Common dividends | | -3.2 | -4.8 | -3.8 | -5.8 | -3.9 | -2.9 | 0.0 | 0.0 | 0.0 | -6.7 | -9.7 | -12.1 | -14.7 | -17.5 | -20.3 | -24.3 | -25.5 | -23.3 |
| 31 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 32 | Ending retained earnings | 48.9 | 46.5 | 46.1 | 44.4 | 39.1 | 34.7 | 32.9 | 37.0 | 46.0 | 57.2 | 63.6 | 68.8 | 73.4 | 77.2 | 80.2 | 82.2 | 82.1 | 82.0 | 85.1 |
| 33 | | | | | | | | | | | | | | | | | | | | |
| 34 | * direct forecast | | | | | | | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | | | | | | |
| 36 | | **TABLE 2. HISTORICAL BALANCE SHEETS** | | | | | | | **TABLE 6. FORECASTED BALANCE SHEETS** | | | | | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | | |
| 38 | | *-6* | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 39 | | | | | | | | | | | | | | | | | | | | |
| 40 | Operating cash | 4.0 | 4.4 | 5.4 | 6.0 | 6.0 | 8.4 | 10.1 | 11.7 | 13.5 | 15.0 | 16.6 | 18.1 | 19.6 | 21.0 | 22.2 | 23.4 | 24.1 | 24.8 | 25.5 |
| 41 | Excess marketable | | | | | | | | | | | | | | | | | | | |
| 42 | securities * | 10.9 | 3.0 | 20.5 | 10.3 | 0.0 | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 43 | Trade receivables | 17.9 | 24.4 | 33.0 | 33.3 | 43.9 | 49.8 | 57.7 | 67.7 | 78.1 | 86.8 | 95.7 | 104.5 | 113.0 | 121.0 | 128.4 | 134.9 | 139.0 | 143.1 | 147.4 |
| 44 | Other receivables | 1.5 | 2.0 | 2.7 | 2.7 | 6.2 | 4.9 | 5.7 | 6.5 | 7.5 | 8.4 | 9.2 | 10.1 | 10.9 | 11.7 | 12.4 | 13.0 | 13.4 | 13.8 | 14.2 |
| 45 | Inventories | 1.9 | 2.1 | 2.8 | 2.5 | 9.0 | 10.9 | 11.9 | 9.7 | 11.1 | 12.4 | 13.7 | 14.9 | 16.1 | 17.3 | 18.3 | 19.3 | 19.8 | 20.4 | 21.0 |
| 46 | Prepaid expenses | 4.3 | 5.1 | 5.3 | 6.0 | 2.4 | 4.4 | 5.0 | 9.5 | 11.0 | 12.2 | 13.5 | 14.7 | 15.9 | 17.1 | 18.1 | 19.0 | 19.6 | 20.2 | 20.8 |
| 47 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 48 | Current assets | 40.5 | 41.0 | 69.7 | 60.8 | 67.5 | 84.2 | 90.4 | 105.1 | 121.2 | 134.9 | 148.6 | 162.3 | 175.5 | 188.0 | 199.5 | 209.5 | 215.8 | 222.3 | 229.0 |
| 49 | | | | | | | | | | | | | | | | | | | | |
| 50 | Gross property, | | | | | | | | | | | | | | | | | | | |

## MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS, ALTERNATIVE TAX ACCOUNTING SYSTEM (FILE MCK_1B.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51 | plant and equipment | 100.0 | 117.7 | 128.2 | 155.6 | 204.7 | 272.5 | 297.6 | 334.2 | 381.1 | 422.7 | 463.5 | 502.6 | 539.1 | 572.1 | 600.7 | 624.1 | 638.1 | 649.5 | 668.8 |
| 52 | Accumulated depreciation | -37.7 | -42.3 | -48.7 | -56.5 | -71.9 | -86.9 | -103.4 | -121.8 | -140.4 | -159.7 | -178.9 | -197.6 | -215.4 | -232.0 | -246.9 | -259.9 | -270.7 | -278.8 | -287.1 |
| 53 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 54 | Net property, plant | | | | | | | | | | | | | | | | | | | |
| 55 | and equipment | 62.3 | 75.4 | 79.5 | 99.1 | 132.8 | 185.6 | 194.2 | 212.4 | 240.8 | 263.1 | 284.7 | 305.0 | 323.7 | 340.1 | 353.7 | 364.2 | 367.5 | 370.6 | 381.7 |
| 56 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 57 | Total assets | 102.8 | 116.4 | 149.2 | 159.9 | 200.3 | 269.8 | 284.6 | 317.5 | 362.0 | 397.9 | 433.3 | 467.3 | 499.2 | 528.1 | 553.2 | 573.7 | 583.3 | 592.9 | 610.7 |
| 58 | | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== |
| 59 | | | | | | | | | | | | | | | | | | | | |
| 60 | Short-term debt | 0.3 | 0.8 | 0.9 | 1.5 | 11.5 | 12.5 | 20.7 | 19.0 | 19.4 | 22.1 | 22.9 | 25.0 | 26.8 | 28.5 | 30.0 | 31.2 | 32.2 | 32.5 | 33.0 |
| 61 | Accounts payable | 7.3 | 11.0 | 11.9 | 10.5 | 14.2 | 16.2 | 18.9 | 24.1 | 27.8 | 30.9 | 34.1 | 37.2 | 40.2 | 43.1 | 45.7 | 48.1 | 49.5 | 51.0 | 52.5 |
| 62 | Other current liabilities | 13.9 | 13.5 | 18.2 | 18.5 | 21.4 | 27.8 | 28.8 | 38.0 | 43.8 | 48.7 | 53.7 | 58.7 | 63.4 | 68.0 | 72.1 | 75.7 | 78.0 | 80.4 | 82.8 |
| 63 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 64 | Total current liabilities | 21.5 | 25.3 | 31.0 | 30.5 | 47.1 | 56.5 | 68.4 | 81.0 | 91.0 | 101.8 | 110.7 | 120.8 | 130.5 | 139.5 | 147.8 | 155.0 | 159.7 | 163.9 | 168.2 |
| 65 | | | | | | | | | | | | | | | | | | | | |
| 66 | Long-term debt | 5.5 | 11.5 | 16.2 | 21.7 | 40.2 | 90.6 | 94.8 | 97.0 | 110.6 | 114.7 | 124.8 | 133.9 | 142.3 | 149.8 | 156.2 | 161.2 | 162.7 | 164.9 | 170.3 |
| 67 | | | | | | | | | | | | | | | | | | | | |
| 68 | Timing differences | 22.3 | 28.2 | 32.3 | 39.7 | 50.3 | 64.4 | 64.9 | 78.9 | 90.8 | 100.7 | 110.5 | 120.2 | 129.4 | 137.9 | 145.4 | 151.8 | 155.2 | 158.7 | 163.4 |
| 69 | | | | | | | | | | | | | | | | | | | | |
| 70 | Common stock * | 4.6 | 4.9 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 |
| 71 | Retained earnings | 48.9 | 46.5 | 46.1 | 44.4 | 39.1 | 34.7 | 32.9 | 37.0 | 46.0 | 57.2 | 63.6 | 68.8 | 73.4 | 77.2 | 80.2 | 82.2 | 82.1 | 82.0 | 85.1 |
| 72 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 73 | Total common equity | 53.5 | 51.4 | 69.7 | 68.0 | 62.7 | 58.3 | 56.5 | 60.6 | 69.6 | 80.8 | 87.2 | 92.4 | 97.0 | 100.8 | 103.8 | 105.8 | 105.7 | 105.6 | 108.7 |
| 74 | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 75 | Total liabilities and equity | 102.8 | 116.4 | 149.2 | 159.9 | 200.3 | 269.8 | 284.6 | 317.5 | 362.0 | 397.9 | 433.3 | 467.3 | 499.2 | 528.1 | 553.2 | 573.7 | 583.3 | 592.9 | 610.7 |
| 76 | | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== |
| 77 | | | | | | | | | | | | | | | | | | | | |
| 78 | Invested capital | 70.7 | 88.9 | 98.6 | 120.6 | 164.7 | 220.0 | 236.9 | 255.4 | 290.4 | 318.3 | 345.5 | 371.5 | 395.5 | 417.0 | 435.3 | 449.9 | 455.8 | 461.6 | 475.5 |
| 79 | Debt/invested capital | 8.2% | 13.8% | 17.3% | 19.2% | 31.4% | 46.9% | 48.8% | 45.4% | 44.8% | 43.0% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% | 42.8% |
| 80 | NOPLAT/invested capital | | | | | | | | | | | | | | | | | | | |
| 81 | (ROIC) | | 8.7% | 9.6% | 9.2% | 8.9% | 8.1% | 3.2% | 9.9% | 10.0% | 9.3% | 9.2% | 9.1% | 9.0% | 8.9% | 8.9% | 8.8% | 8.4% | 8.6% | 9.0% |
| 82 | | | | | | | | | | | | | | | | | | | | |
| 83 | * direct forecast | | | | | | | | | | | | | | | | | | | |
| 84 | | | | | | | | | | | | | | | | | | | | |
| 85 | | **TABLE 3. HISTORICAL FREE CASH FLOW** | | | | | | | **TABLE 7. FORECASTED FREE CASH FLOW** | | | | | | | | | | | |
| 86 | | | | | | | | | | | | | | | | | | | | |
| 87 | *Free cash flow* | | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 88 | | | | | | | | | | | | | | | | | | | | |
| 89 | Revenues | | 222.3 | 272.3 | 299.5 | 350.0 | 418.9 | 505.4 | 598.6 | 690.6 | 768.2 | 846.7 | 924.4 | 999.7 | 1070.9 | 1136.1 | 1193.6 | 1229.4 | 1266.3 | 1304.3 |
| 90 | Operating expenses | | -205.8 | -249.6 | -274.7 | -320.5 | -383.6 | -467.4 | -538.8 | -621.5 | -691.4 | -762.0 | -831.9 | -899.7 | -963.8 | -1022.5 | -1074.2 | -1106.5 | -1139.7 | -1173.9 |
| 91 | Depreciation | | -9.3 | -11.2 | -13.0 | -15.0 | -17.7 | -26.4 | -28.7 | -32.0 | -36.9 | -41.0 | -45.1 | -49.1 | -53.0 | -56.5 | -59.7 | -62.5 | -64.0 | -64.5 |
| 92 | Incr/Decr in timing diff's | | -5.9 | -4.1 | -7.4 | -10.5 | -14.1 | -0.5 | -14.0 | -11.9 | -9.9 | -9.9 | -9.6 | -9.2 | -8.5 | -7.5 | -6.4 | -3.5 | -3.4 | -4.8 |
| 93 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 94 | Earnings after increase/ | | | | | | | | | | | | | | | | | | | |
| 95 | decrease in timing diff's | | 1.3 | 7.4 | 4.4 | 4.0 | 3.5 | 11.1 | 17.1 | 25.2 | 30.0 | 33.8 | 37.7 | 41.7 | 45.6 | 49.5 | 53.2 | 57.0 | 59.2 | 61.1 |
| 96 | Taxes on earnings after | | | | | | | | | | | | | | | | | | | |
| 97 | incr/decr in timing diff's | | -0.3 | -2.5 | -1.7 | -1.9 | -1.9 | -4.2 | -6.7 | -9.8 | -11.7 | -13.2 | -14.7 | -16.2 | -17.8 | -19.3 | -20.8 | -22.2 | -23.1 | -23.8 |
| 98 | Add back increase/decr | | | | | | | | | | | | | | | | | | | |
| 99 | in timing differences | | 5.9 | 4.1 | 7.4 | 10.5 | 14.1 | 0.5 | 14.0 | 11.9 | 9.9 | 9.9 | 9.6 | 9.2 | 8.5 | 7.5 | 6.4 | 3.5 | 3.4 | 4.8 |
| 100 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |

## MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS, ALTERNATIVE TAX ACCOUNTING SYSTEM (FILE MCK_1B.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | NOPLAT | | 6.9 | 9.0 | 10.1 | 12.6 | 15.7 | 7.4 | 24.4 | 27.2 | 28.2 | 30.5 | 32.6 | 34.6 | 36.3 | 37.7 | 38.9 | 38.2 | 39.6 | 42.1 |
| 102 | Add back depreciation | | 9.3 | 11.2 | 13.0 | 15.0 | 17.7 | 26.4 | 28.7 | 32.0 | 36.9 | 41.0 | 45.1 | 49.1 | 53.0 | 56.5 | 59.7 | 62.5 | 64.0 | 64.5 |
| 103 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 104 | Gross cash flow | | 16.2 | 20.2 | 23.1 | 27.6 | 33.4 | 33.8 | 53.2 | 59.2 | 65.1 | 71.5 | 77.7 | 83.7 | 89.3 | 94.3 | 98.6 | 100.7 | 103.5 | 106.6 |
| 105 | | | | | | | | | | | | | | | | | | | | |
| 106 | Change in working | | | | | | | | | | | | | | | | | | | |
| 107 | capital (+ if increase) | | 5.1 | 5.6 | 2.4 | 10.4 | 2.5 | 8.3 | 0.3 | 6.6 | 5.6 | 5.6 | 5.6 | 5.4 | 5.1 | 4.7 | 4.1 | 2.6 | 2.6 | 2.7 |
| 108 | Capital expenditures | | | | | | | | | | | | | | | | | | | |
| 109 | (+ if positive) | | 22.4 | 15.3 | 32.6 | 48.7 | 70.5 | 35.0 | 47.0 | 60.3 | 59.2 | 62.6 | 65.5 | 67.8 | 69.4 | 70.2 | 70.2 | 65.7 | 67.1 | 75.6 |
| 110 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 111 | Gross investment | | 27.5 | 20.9 | 35.0 | 59.1 | 73.0 | 43.3 | 47.3 | 66.9 | 64.8 | 68.2 | 71.1 | 73.2 | 74.5 | 74.9 | 74.3 | 68.3 | 69.8 | 78.4 |
| 112 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 113 | Free cash flow | | -11.3 | -0.7 | -11.9 | -31.5 | -39.6 | -9.5 | 5.9 | -7.7 | 0.3 | 3.3 | 6.7 | 10.5 | 14.8 | 19.4 | 24.2 | 32.4 | 33.8 | 28.2 |
| 114 | | | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== | ====== |
| 115 | | | | | | | | | | | | | | | | | | | | |
| 116 | *Financial cash flow* | | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 117 | | | | | | | | | | | | | | | | | | | | |
| 118 | Incr(+)/Decr(-) in excess | | | | | | | | | | | | | | | | | | | |
| 119 | marketable securities | | -7.9 | 17.5 | -10.2 | -10.3 | 5.8 | -5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 120 | After-tax interest | | | | | | | | | | | | | | | | | | | |
| 121 | income (-) | | 0.0 | 0.0 | 0.0 | -0.5 | -0.4 | -0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 122 | Incr(-)/Decr(+) in short- | | | | | | | | | | | | | | | | | | | |
| 123 | and long-term debt | | -6.5 | -4.8 | -6.1 | -28.5 | -51.4 | -12.4 | -0.4 | -14.1 | -6.8 | -10.9 | -11.1 | -10.3 | -9.2 | -7.8 | -6.2 | -2.5 | -2.5 | -5.9 |
| 124 | After-tax interest | | | | | | | | | | | | | | | | | | | |
| 125 | expense (+) | | 0.2 | 0.5 | 0.6 | 2.1 | 2.5 | 6.2 | 6.3 | 6.4 | 7.1 | 7.5 | 8.1 | 8.7 | 9.3 | 9.8 | 10.2 | 10.6 | 10.7 | 10.8 |
| 126 | Common dividends (+) | | 3.2 | 4.8 | 3.8 | 5.8 | 3.9 | 2.9 | 0.0 | 0.0 | 0.0 | 6.7 | 9.7 | 12.1 | 14.7 | 17.5 | 20.3 | 24.3 | 25.5 | 23.3 |
| 127 | Incr(-)/Decr(+) in | | | | | | | | | | | | | | | | | | | |
| 128 | common stock | | -0.3 | -18.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 129 | | | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------- | ------- | ------- | ------- | ------- | ------- |
| 130 | Financial cash flow | | -11.3 | -0.7 | -11.9 | -31.5 | -39.6 | -9.5 | 5.9 | -7.7 | 0.3 | 3.3 | 6.7 | 10.5 | 14.8 | 19.4 | 24.2 | 32.4 | 33.8 | 28.2 |
| 131 | | | | | | | | | | | | | | | | | | | | |
| 132 | Effect tax rate on earnings | | | | | | | | | | | | | | | | | | | |
| 133 | before incr in tim diff's | | 3.6% | 21.8% | 14.3% | 12.9% | 10.9% | 36.3% | 21.5% | 26.5% | 29.3% | 30.2% | 31.0% | 32.0% | 32.9% | 33.8% | 34.8% | 36.8% | 36.9% | 36.2% |
| 134 | | | | | | | | | | | | | | | | | | | | |
| 135 | | **TABLE 4. HISTORICAL RATIOS FOR FORECAST ASSUMPTIONS** | | | | | | | **TABLE 8. FORECAST ASSUMPTIONS** | | | | | | | | | | | |
| 136 | | | | | | | | | | | | | | | | | | | | |
| 137 | | *-6* | *-5* | *-4* | *-3* | *-2* | *-1* | *0* | ***1*** | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 138 | | | | | | | | | | | | | | | | | | | | |
| 139 | Operations | | | | | | | | | | | | | | | | | | | |
| 140 | Real growth (*g*) | | | | | | | | 15.0% | 12.0% | 8.0% | 7.0% | 6.0% | 5.0% | 4.0% | 3.0% | 2.0% | 0.0% | 0.0% | 0.0% |
| 141 | Inflation (*i*) | | | | | | | | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% | 3.0% |
| 142 | Revenue growth (*c*) | | 12.5% | 22.5% | 10.0% | 16.9% | 19.7% | 20.6% | 18.5% | 15.4% | 11.2% | 10.2% | 9.2% | 8.2% | 7.1% | 6.1% | 5.1% | 3.0% | 3.0% | 3.0% |
| 143 | Operating expenses/ | | | | | | | | | | | | | | | | | | | |
| 144 | revenues | 88.8% | 92.6% | 91.7% | 91.7% | 91.6% | 91.6% | 92.5% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% | 90.0% |
| 145 | | | | | | | | | | | | | | | | | | | | |
| 146 | Working cap/revenues | | | | | | | | | | | | | | | | | | | |
| 147 | Operating cash/revenues | 2.0% | 2.0% | 2.0% | 2.0% | 1.7% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| 148 | Trade receiv's/revenues | 9.1% | 11.0% | 12.1% | 11.1% | 12.5% | 11.9% | 11.4% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% | 11.3% |
| 149 | Other receiv's/revenues | 0.8% | 0.9% | 1.0% | 0.9% | 1.8% | 1.2% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% | 1.1% |
| 150 | Inventories/revenues | 1.0% | 0.9% | 1.0% | 0.8% | 2.6% | 2.6% | 2.4% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% |

## MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS, ALTERNATIVE TAX ACCOUNTING SYSTEM (FILE MCK_1B.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 151 | Prepaid exp's/revenues | 2.2% | 2.3% | 1.9% | 2.0% | 0.7% | 1.1% | 1.0% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% | 1.6% |
| 152 | Accounts payable/rev's | 3.7% | 4.9% | 4.4% | 3.5% | 4.1% | 3.9% | 3.7% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% | 4.0% |
| 153 | Other curr liab's/rev's | 7.0% | 6.1% | 6.7% | 6.2% | 6.1% | 6.6% | 5.7% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% | 6.3% |
| 154 | | | | | | | | | | | | | | | | | | | | |
| 155 | Property, Plant and | | | | | | | | | | | | | | | | | | | |
| 156 | Equipment (PPE) | | | | | | | | | | | | | | | | | | | |
| 157 | PPE economic life (*n*) | | | | | | | | | | | | | | | | | | 10 | |
| 158 | *F* _sub_ *g* (see Sect 6) | | | | | | | | | | | | | | | | | | 10.0000 | |
| 159 | *F* _sub_ *c* (see Sect 6) | | | | | | | | | | | | | | | | | | 8.7861 | |
| 160 | Real PPE/rev's (*K*) | | | | | | | | | | | | | | | | | | 0.580 | |
| 161 | *M* (see Section 6) | | | | | | | | | | | | | | | | | | 0.510 | |
| 162 | *H* (see Section 6) | | | | | | | | | | | | | | | | | | 0.426 | |
| 163 | Net PPE/revenues | 31.5% | 33.9% | 29.2% | 33.1% | 37.9% | 44.3% | 38.4% | 35.5% | 34.9% | 34.2% | 33.6% | 33.0% | 32.4% | 31.8% | 31.1% | 30.5% | 29.9% | 29.3% | 29.3% |
| 164 | Depreciation/net PPE * | | 14.9% | 14.9% | 16.4% | 15.1% | 13.3% | 14.2% | 14.8% | 15.1% | 15.3% | 15.6% | 15.8% | 16.1% | 16.4% | 16.6% | 16.9% | 17.2% | 17.4% | 17.4% |
| 165 | Retirements/net PPE * | | 7.5% | 6.4% | 6.5% | -0.4% | 2.0% | 5.3% | 5.3% | 6.3% | 7.3% | 8.3% | 9.3% | 10.3% | 11.2% | 12.2% | 13.2% | 14.2% | 15.2% | 15.2% |
| 166 | | | | | | | | | | | | | | | | | | | | |
| 167 | Taxes | | | | | | | | | | | | | | | | | | | |
| 168 | Tax rate | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% | 39.0% |
| 169 | PPE tax life (*q*) | | | | | | | | | | | | | | | | | | 5 | |
| 170 | *J* (see Section 8) | | | | | | | | | | | | | | | | | | 2.160 | |
| 171 | Timing diff's/net PPE | 35.8% | 37.4% | 40.6% | 40.1% | 37.8% | 34.7% | 33.4% | 37.1% | 37.7% | 38.3% | 38.8% | 39.4% | 40.0% | 40.5% | 41.1% | 41.7% | 42.2% | 42.8% | 42.8% |
| 172 | | | | | | | | | | | | | | | | | | | | |
| 173 | Interest rate items | | | | | | | | | | | | | | | | | | | |
| 174 | Real borrowing rate | | | | | | | | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% | 6.0% |
| 175 | Nominal borrowing rate | | | | | | | | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% | 9.0% |
| 176 | Real cost of equity | | | | | | | | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% | 11.8% |
| 177 | Nominal cost of equity | | | | | | | | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% |
| 178 | | | | | | | | | | | | | | | | | | | | |
| 179 | Book value target for | | | | | | | | | | | | | | | | | | | |
| 180 | financial strength | | | | | | | | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% | 57.2% |
| 181 | | | | | | | | | | | | | | | | | | | | |
| 182 | This year's short-term/last | | | | | | | | | | | | | | | | | | | |
| 183 | year's long-term debt | | | | | | | | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% | 20.0% |
| 184 | | | | | | | | | | | | | | | | | | | | |
| 185 | * last year's net PPE | | | | | | | | | | | | | | | | | | | |
| 186 | | | | | | | | | | | | | | | | | | | | |
| 187 | | | | | | | | | **VALUE CALCULATIONS** | | | | | | | | | | | |
| 188 | | | | | | | | | | | | | | | | | | | | |
| 189 | | | | | | | | | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | ***11*** | *12* |
| 190 | | | | | | | | | | | | | | | | | | | | |
| 191 | *1. Free Cash Flow* | | | | | | | | | | | | | | | | | | | |
| 192 | | | | | | | | | | | | | | | | | | | | |
| 193 | Excess marketable | | | | | | | | | | | | | | | | | | | |
| 194 | securities (at year start) | | | | | | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 195 | Interest-bearing debt | | | | | | | | | | | | | | | | | | | |
| 196 | (at year start) | | | | | | | | 115.5 | 115.9 | 130.0 | 136.8 | 147.7 | 158.8 | 169.1 | 178.3 | 186.2 | 192.4 | 194.9 | 197.4 |
| 197 | Free cash fl (at year end) | | | | | | | | 5.9 | -7.7 | 0.3 | 3.3 | 6.7 | 10.5 | 14.8 | 19.4 | 24.2 | 32.4 | 33.8 | 28.2 |
| 198 | WACC | | | | | | | | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% | 10.1% |
| 199 | Computed value of oper | | | | | | | | | | | | | | | | | | | |
| 200 | assets (at year start) | | | | | | | | 198.5 | 212.8 | 242.0 | 266.2 | 290.0 | 312.7 | 333.9 | 353.0 | 369.4 | 382.6 | 389.1 | 394.8 |

## MCKAY VALUATION BY FREE CASH FLOW AND ABNORMAL EARNINGS METHODS, ALTERNATIVE TAX ACCOUNTING SYSTEM (FILE MCK_1B.XLS)

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 201 | Computed equity value (at | | | | | | | | | | | | | | | | | | | |
| 202 | year start) | | | | | | | | 83.0 | 96.8 | 112.0 | 129.4 | 142.3 | 153.9 | 164.8 | 174.7 | 183.2 | 190.2 | 194.2 | 197.4 |
| 203 | | | | | | | | | | | | | | | | | | | | |
| 204 | Desired E/(D+E) year 12 | | | | | | | | 50.0% | | | | | | | | | | | |
| 205 | Result E/(D+E) year 12 | | | | | | | | 50.0% | | | | | | | | | | | |
| 206 | Result E/(D+E) all years | | | | | | | | 41.8% | 45.5% | 46.3% | 48.6% | 49.1% | 49.2% | 49.4% | 49.5% | 49.6% | 49.7% | 49.9% | 50.0% |
| 207 | Drive to 0 by Goal Seek | | | | | | | | | | | | | | | | | | | |
| 208 | (vary year 1 Book value | | | | | | | | | | | | | | | | | | | |
| 209 | target for financial | | | | | | | | | | | | | | | | | | | |
| 210 | strength (I180)!) | | | | | | | | | | | | | | | | | | | |
| 211 | | | | | | | | | | | | | | | | | | | | |
| 212 | *2. Abnormal Earnings* | | | | | | | | | | | | | | | | | | | |
| 213 | | | | | | | | | | | | | | | | | | | | |
| 214 | Interest-bearing debt | | | | | | | | | | | | | | | | | | | |
| 215 | (at year start) | | | | | | | | 115.5 | 115.9 | 130.0 | 136.8 | 147.7 | 158.8 | 169.1 | 178.3 | 186.2 | 192.4 | 194.9 | 197.4 |
| 216 | Book equity value | | | | | | | | | | | | | | | | | | | |
| 217 | (at year start) | | | | | | | | 56.5 | 60.6 | 69.6 | 80.8 | 87.2 | 92.4 | 97.0 | 100.8 | 103.8 | 105.8 | 105.7 | 105.6 |
| 218 | Net income (at year end) | | | | | | | | 4.1 | 9.0 | 11.2 | 13.1 | 14.9 | 16.7 | 18.5 | 20.4 | 22.3 | 24.2 | 25.4 | 26.5 |
| 219 | Cost of equity | | | | | | | | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% | 14.8% |
| 220 | Abnormal earnings | | | | | | | | -4.3 | 0.0 | 0.9 | 1.1 | 2.0 | 3.0 | 4.2 | 5.5 | 6.9 | 8.6 | 9.8 | 10.8 |
| 221 | Computed equity value | | | | | | | | | | | | | | | | | | | |
| 222 | (at year start) | | | | | | | | 86.2 | 98.9 | 113.6 | 130.4 | 143.0 | 154.5 | 165.3 | 175.0 | 183.5 | 190.3 | 194.2 | 197.4 |
| 223 | | | | | | | | | | | | | | | | | | | | |
| 224 | Desired E/(D+E) year 12 | | | | | | | | 50.0% | | | | | | | | | | | |
| 225 | Result E/(D+E) year 12 | | | | | | | | 50.0% | | | | | | | | | | | |
| 226 | Result E/(D+E) all years | | | | | | | | 42.7% | 46.0% | 46.6% | 48.8% | 49.2% | 49.3% | 49.4% | 49.5% | 49.6% | 49.7% | 49.9% | 50.0% |
| 227 | Drive to 0 by Goal Seek | | | | | | | | | | | | | | | | | | | |
| 228 | (vary year 1 Book value | | | | | | | | | | | | | | | | | | | |
| 229 | target for financial | | | | | | | | | | | | | | | | | | | |
| 230 | strength (I180)!) | | | | | | | | | | | | | | | | | | | |