ABSORPTION COSTING AND VARIABLE COSTING INCOME DIFFERENCES: EXCEPTIONS TO THE GENERAL EXPECTATIONS

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ABSTRACT

Although it is always true that the difference between absorption costing income and variable costing income is equal to the change in fixed cost in inventories, it is not always true that changes in inventory unit levels and changes in the fixed cost in inventory are positively correlated. The relationship between inventory levels and fixed cost in inventory also depends upon the inventory cost flow assumption and upon the direction and magnitude of any change in the fixed manufacturing overhead application rate in relation to the direction of the change in inventory units. After demonstrating the conceptual nature and extent of the exceptions, instructional resources are provided to assist instructors in integrating these concepts into their managerial accounting courses. These resources are in the form of extended problems which demonstrate the exceptions in the context of changes in overhead costs related alternatively to contractions and expansions in manufacturing capacity and cost.

INTRODUCTION

Textbooks correctly present the difference between absorption costing income and variable costing income as always being equal to the change in fixed overhead costs in inventory under absorption costing. Additionally, this difference in the income measures is presented in the context of a direct relationship between the income difference under the two methods and the change in inventory unit levels.

Presentations of the direct relationship between income differences and inventory unit changes give rise to a set of general expectations reflecting that income difference to inventory relationship:

(1) Pd = S, EIU = BIU, $FMOH_{EI} = FMOH_{BI}$, ACI = VCI;

(2) Pd > S, EIU > BIU, $FMOH_{EI} > FMOH_{BI}$, ACI > VCI; and,

(3) Pd < S, EIU < BIU, $FMOH_{EI} < FMOH_{BI}$, ACI < VCI

where
Pd = production in units
S = sales in units
EIU = ending inventory units
BIU = beginning inventory units
$FMOH_{EI}$ = fixed overhead in ending inventories
$FMOH_{BI}$ = fixed overhead in beginning inventories
ACI = absorption costing income
VCI = variable costing income

However, the consistency of the change in absorbed fixed overhead with the direction of inventory unit changes is seen in this study also to be dependent on the direction and magnitude of the change in fixed overhead rates applied to EIU and BIU and on the inventory cost flow assumption. The conceptual analysis in the current study is an extension of the work of Ajinka, Ataise, and Bamber (AAB, 1986, pages 269,280), who have pointed to the possibility of deviations from the direct relationship. No other discussion of these exceptions is present in the extant accounting research literature.

Additionally, the current study provides instructional resources for integrating this extension into advanced managerial and cost accounting courses. This paper will certainly be of interest to instructors who wish to address these exceptions in class or those who wish to be more aware for themselves about the extent and nature of these expectations. The instructional resources will aid anyone designing problems or cases requiring preparation of absorption costing and variable costing income statements.

The study will show that exceptions are possible under FIFO and Weighted Average cost flow assumptions but not under LIFO. International Financial Reporting Standards do not permit the use of LIFO. Thus, IFRS allow only the cost flow assumptions which may produce deviations from the expectation of positive correlation between changes in inventory levels and differences between absorption costing and variable costing income.

From the point of view of management accounting practice and the design of accounting systems, knowledge of these exceptions can be important both to financial managers and systems designers who will probably encounter these exceptions in the management and design environments. The instructional resources will demonstrate the exceptions in circumstances in which there are changes in manufacturing processes that involve substantial changes in capacity and costs. This may include the deletion of outdated and expensive processes or the addition of new capacity to meet growing demand.

IDENTIFYING CONDITIONS LEADING TO EXCEPTIONS

The interaction of fixed overhead rates with inventory unit changes is readily seen by expanding the difference in fixed overhead in inventories. AAB (1986, pages 269,280) provide a convenient derivation showing

$$ACI - VCI = FMOH_{EI} - FMOH_{BI} \quad (1)$$

In turn Eq.1 is restated as

$$ACI - VCI = (EIU)\,CR - (BIU)\,(PR) \quad (2)$$

where

EIU, BIU = Current period ending and beginning inventory units, respectively,

CR, PR = Current and previous period fixed manufacturing overhead rate, respectively.

Looking more closely at Eq. (2) it can readily be seen that an increase (or decrease) in inventory units may be offset or more than offset by an opposite change in the overhead rate. In these offset cases, the general expectations may be violated. As the paper will show, violations of the general expectations are systematic, but the possibility their occurrence also will be seen to depend on the cost flow assumption. While the source of the exceptions to the general expectations is obvious in a general sense, these conditions will be systematically analyzed and summarized.

To provide a framework for evaluating exceptions, equations (1) and (2) are arranged and extended in Exhibit 1 to restate the three possible relationships of the relative income values for ACI and VCI in terms of ratios of any change in inventory unit levels and any change in fixed manufacturing overhead rates. The conditions are specified in Exhibit 1 as Equations 3, 4, and 5 and are used systematically in Exhibits 3, 4, and 5 to examine the detail of the relationships between the income differences, inventory levels, and overhead rates.

EXHIBIT 1
Income Differences In Terms of Relative Inventory Levels and Overhead Rates

Difference 1		Difference 2		Difference 3	
ACI = VCI, when		ACI > VCI, when		ACI < VCI, when	
$FMOH_{EI} - FMOH_{BI} = 0$		$FMOH_{EI} - FMOH_{BI} > 0$		$FMOH_{EI} - FMOH_{BI} < 0$	
$(EIU)(CR) - (BIU)(PR) = 0$		$(EIU)(CR) - (BIU)(PR) > 0$		$(EIU)(CR) - (BIU)(PR) < 0$	
that is,		that is,		that is,	
$(EIU/BIU)\,(CR/PR) = 1$	**Eq. (3)**	$(EIU/BIU)\,(CR/PR) > 1$	**Eq. (4)**	$(EIU/BIU)\,(CR/PR) < 1$	**Eq. (5)**

Equations 3, 4, and 5 will be used within the context of the particular cost flow assumptions in which exceptions may occur.

Note that the outcomes of the analysis are robust in general with respect to whether the fixed overhead rates considered are the standard or actual rates in the sense of the relative proportional changes in inventory units and overhead rates. However, for a particular fiscal period, the results for standard and actual rates may differ. This difference is possible because of a shift in the dollar value of variances taken to income under standard costing in comparison to actual costing.

AAB (1986, pages 270-271) provide a framework for understanding the potential differences that may result between standard and actual costing. Exhibit 1 presents their four cases analyzing the difference in ACI and VCI in terms of changes in overhead rates and a prorated favorable or unfavorable Production volume variance (abbreviated as PVV). AAB assumed that all flexible budget variances are zero. Their

cases I and III correspond to results under actual costing, while Cases II and IV correspond to standard costing.

EXHIBIT 1
AAB Cases for Income Differences,
Inventory Levels, Overhead Rates, and Over/Under Applied Overhead

Case I: ACI – VCI = (EIU) CR – (BIU) (PR) + OAO(-UAO) where CR = PR and PVV is prorated to the CGS and inventories as OAO (over-allocated overhead) or UAO (under-allocated overhead);

Case II: ACI – VCI = (EIU) CR – (BIU) (PR) where CR = PR and PVV is closed to CGS;

Case III: ACI – VCI = (EIU) CR – (BIU) (PR) + OAO(-UAO) where CR ≠ PR and PVV is prorated to the CGS and inventories as OAO (over-allocated overhead) or UAO (under-allocated overhead); and,

Case IV: ACI – VCI = (EIU) CR – (BIU) (PR) where CR ≠ PR and PVV is closed to CGS.

Thus, the CR and PR used by AAB are the predetermined overhead rates for the current and previous periods, established for standard costing. In cases I and III, the addition of the under-applied or over-applied overhead to inventories effectively revises the standard overhead rate to the actual overhead rate. In cases II and IV, the inventories are left at standard cost, while their portion of the variance is expensed through the cost of goods sold.

So, under standard costing, all of the overhead variance is taken to income. Under actual costing, a portion of the overhead variance is allocated to the inventories, effectively changing the inventory from standard cost per unit to the actual cost per unit. This shift from standard cost to actual cost can cause a shift in the proportional relationship between CR and PR. This shift in the relationship of CR and PR may result in a different proportional relationship between inventory unit changes and overhead rate changes such that the income relationship is different under standard costing and actual costing. This difference in outcome is demonstrated directly in the instructional resources and addressed below.

Although the relative proportional changes in inventory units and changes in overhead rates are the underlying causes of the difference in income, the cost flow assumption can be understood to be the overarching factor within which any exceptions to the general expectations can occur. The following analysis shows that exceptions will not occur under the LIFO assumption, but may occur under FIFO and Weighted Average cost flow assumptions. Thus the cost flow assumption are analyzed prior to an elaboration of the three income relationships.

ANALYSIS OF COST FLOW ASSUMPTIONS AND THE EFFECT OF INVENTORY LEVEL AND OVERHEAD RATE

The possible exceptions to the general expectations are evaluated in terms of the three costs flows: LIFO, FIFO, and Weighted Average. LIFO and FIFO are examined directly while Weighted Average is addressed as an extension of the conclusions with respect to FIFO.

In evaluating the three cost flow assumptions, we assume that S > BIU. The following notation is used for the goods available for sale:

Goods available= Beginning Inventory Units + Units Produced
= BIU + Pd.

The LIFO cost flow is approached first because the analysis is the simplest, and the LIFO cost flow allows no exceptions.

LIFO Cost Flow, Income, Inventory, and Overhead Rates

An analysis of LIFO the context of the three general expectations provides a confirmation of their validity with respect to the cost flow assumption.

1. Pd = S, EIU = BIU, ACI = VCI: Sales first come from the current production, so that the EIU consist all of the one layer from the prior period, assumed to have overhead cost applied at the previous period rate, PR. Thus,

(EIU) PR = (BIU) (PR) and $FMOH_{EI} = FMOH_{BI}$

without respect to the magnitude and direction of any overhead rate changes.

2. Pd > S, EIU > BIU, ACI > VCI: Sales come first from the current production, so that the EIU are a combination of two layers: those in the beginning inventory, (BIU) (PR), and those which were produced and not sold, EIU = BIU + (Pd –S). Thus,

FMOHEI = BIU(PR) + (Pd –S)(CR) so that $FMOH_{EI} > FMOH_{BI}$

without respect to the magnitude and direction of any overhead rate changes.

3. Pd < S, EIU < BIU, ACI < VCI: Sales exceed current production and first come from the current production, so that the EIU are a subset of the one layer from the previous period, assumed to have cost applied at the previous period rate, PR. Thus,

EIU = [BIU - (S – Pd)], noting that

BIU>(S-PD) and S>Pd

and ending inventory cost is

$FMOH_{EI}$ = (EIU) PR

$FMOH_{EI}$ = [(BIU - (S – Pd)) (PR)] < (BIU)(PR)

so that $FMOH_{EI} < FMOH_{BI}$ without respect to the magnitude and direction of any overhead rate changes.

The analysis has shown that with a LIFO cost flow assumption, the general expectations holds true under all inventory changes without respect to overhead rate changes. The direction of the income difference, ACI – VCI, has a direct relationship to the direction of change in the inventory level, EIU – BIU. There are no exceptions for LIFO.

FIFO Cost Flow, Income, Inventory, and Overhead Rates

Under the FIFO cost flow assumption, sales come first from the beginning layer of inventory brought from the prior period, then from current production. The EIU consist of one layer from the current period, assumed to have cost applied at the current period rate, CR. Whether fixed overhead in inventories changes depends on whether changes in inventory units and changes in overhead rates are inconsistent in direction and different in proportion. This is seen by examining a combination of Eq. (1) and (2):

ACI – VCI = $FMOH_{EI} - FMOH_{BI}$ = (EIU) CR – (BIU) (PR) (1) & (2)

The relationships for FIFO cost flows are evaluated in terms of the three general income relationships in Exhibits 3, 4, and 5, and using the equations (3), (4), and (5) developed in Exhibit 1 to examine the income relationships in terms of inventory levels and overhead rates.

Exhibit 3 presents an analysis of the relationships

Pd = S, EIU = BIU, ACI = VCI

leading to Eq. (3):

(EIU/BIU) (CR/PR) = 1 (3)

Since there is no change in the number of inventory units, any change in fixed manufacturing overhead in inventories arises from the change in the fixed manufacturing overhead rate, that is, whether (EIU) CR = (BIU) (PR) depends on whether the overhead rate changes.

Exhibit 3 shows that for Pd = S and EIU = BIU, the relationship between ACI and VCI for two out of three of the rate changes are not consistent with the general expectation that ACI = VCI.

EXHIBIT 3
Expected Relationship:
Pd = S, EIU = BIU, ACI = VCI,
noting that EIU/BIU = 1

Panel A. If the overhead rate does not change, then CR = PR, and CR/PR = 1 so that
(EIU/BIU) (CR/PR) =1
and from Eq. (3), ACI = VCI
This is consistent with the expected relationship.

Panel B. If the overhead rate increases, then CR > PR, and CR/PR > 1 so that
(EIU/BIU) (CR/PR) >1
and from Eq. (4), ACI > VCI
This is not consistent with the expected relationship.

Panel C. If the overhead rate decreases, then CR < PR, and CR/PR < 1 so that
(EIU/BIU) (CR/PR) <1
and from Eq. (5), ACI < VCI
This is not consistent with the expected relationship.

Panel A shows that, when inventory levels do not change, the general expectation that ACI=VCI is true if CR=PR. However, panels B and C show that in the two cases in which the overhead rate changes, there are exceptions.

The relationship Pd > S, EIU > BIU, ACI > VCI is examined in the three panels of Exhibit 4. The excess of production over sales leads to a growth in inventory level with all EIU assumed to be from the current production. However, the change in fixed overhead in inventories is seen to depend on the direction and magnitude of any change in the overhead rate.

Panels A and B show that, for Pd > S and EIU > BIU, the general expectation that ACI > VCI is true when the current period rate is greater than or equal to the prior period rate. That is, the

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EXHIBIT 4
Expected Relationship:
Pd > S, EIU > BIU, ACI > VCI,
noting that EIU/BIU > 1

Panel A. If the overhead rate does not change, that is, CR = PR, then CR/PR = 1 so that
(EIU/BIU) (CR/PR) >1
and from Eq (4), ACI > VCI
This is consistent with the expected relationship.

Panel B. If the overhead rate increases, that is, CR > PR, then CR/PR > 1 so that
(EIU/BIU) (CR/PR) >1
and from Eq (4), ACI > VCI
This is consistent with the expected relationship.

Panel C. If the overhead rate decreases, that is, CR < PR, then CR/PR < 1 so that
(EIU/BIU) (CR/PR) ≤ 1 depending on the relative degree to which the overhead rate changes.

1. If CR declines in amount such that the proportionate increase in inventory is just offset by the proportionate decline in the overhead rate, then
(EIU/BIU) (CR/PR) =1
and from Eq (3), ACI = VCI
This is not consistent with the expected relationship.

2. If CR declines in amount such that the proportionate increase in inventory is more than offset by the proportionate decline in the overhead rate, then
(EIU/BIU) (CR/PR) <1
and from Eq (5), ACI < VCI
This is not consistent with the expected relationship.

3. If CR declines in amount such that the proportionate increase in inventory is less than offset by the proportionate decline in the overhead rate, then
(EIU/BIU) (CR/PR) >1
and from Eq (4), ACI > VCI
This is consistent with the expected relationship.

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general expectation that ACI > VCI when EIU > BIU holds if CR ≥ PR.

Panel C of Exhibit 4 shows that when that when the overhead rate decreases, moving against the change in inventory level, then there are two possible exceptions to the general expectations. In Panel C1 when the decline in overhead rate just offsets the increase in inventory level, then fixed overhead in inventory declines to the degree that ACI = VCI. If, as shown in Panel C2, the decline in overhead rate more than offsets the increase in inventory level, then fixed overhead in inventory declines such that ACI < VCI.

EXHIBIT 5
Expected Relationship:
Pd < S, EIU < BIU, ACI < VCI,
noting that EIU/BIU < 1

Panel A. If the overhead rate does not change, that is CR = PR, then CR/PR = 1 so that
(EIU/BIU) (CR/PR) <1
and from Eq (5), ACI < VCI
This is consistent with the expected relationship.

Panel B. If the overhead rate increases, that is CR > PR, then CR/PR > 1 so that
(EIU/BIU) (CR/PR) ≥ 1, depending on the relative degree to which the overhead rate changes.

1. If CR increases in amount such that the proportionate decrease in inventory is just offset by the proportionate increase in the overhead rate, then
(EIU/BIU) (CR/PR) =1
and from Eq (3), ACI = VCI
This is not consistent with the expected relationship.

2. If CR increases in amount such that the proportionate decrease in inventory is more than offset by the proportionate increase in the overhead rate, then
(EIU/BIU) (CR/PR) >1
and from Eq (4), ACI > VCI
This is not consistent with the expected relationship.

3. If CR increases in amount such that the proportionate decrease in inventory is less than offset by the proportionate increase in the overhead rate, then
(EIU/BIU) (CR/PR) >1
and from Eq (5), ACI < VCI
This is consistent with the expected relationship.

Panel C. If the overhead rate decreases, that is, CR < PR, then CR/PR ≤ 1 so that
(EIU/BIU) (CR/PR) <1
and from Eq (5), ACI < VCI
This is consistent with the expected relationship.

Exhibit 5 shows that, for Pd < S and EIU < BIU, the relationship between ACI and VCI is consistent with the general expectation when CR ≤ PR. That is, Panels A and C show that when the overhead rate does not change or when it decreases with the decrease in the inventory level, then fixed overhead in inventories decreases and ACI < VCI.

Exceptions occur for Pd < S and EIU < BIU when the overhead rate moves against change in the inventory level change; that is, when CR > PR. Panel B1 shows that if CR increases in amount such that the proportionate decrease in inventory is just offset by the proportionate increase in the overhead rate, then ACI = VCI. On the other hand, Panel B2 shows that when CR increases in amount such that the proportionate decrease in inventory is more than offset by the proportionate increase in the overhead rate, then ACI > VCI.

Following from the analyses and comments on Exhibits 3, 4, and 5, the relationships producing exceptions to the general rules under a FIFO cost flow assumption can be summarized as follows:

1. **When Pd = S and EIU = BIU , and when the FMOHR changes, then there is an exception to the general rule that ACI = VCI.** There are two conditions leading to exceptions. When CR > PR, then ACI > VCI. When CR < PR, then ACI < VCI.

2. **When Pd > S and EIU > BIU , and when the FMOHR declines, then there is possibly an exception to the general rule that ACI > VCI.** If the decline in the FMOHR exactly offsets the increase in inventory units then ACI = VCI. When the decline in FMOHR from the previous period to the current period more than offsets the increase in inventory units, then ACI < VCI.

3. **When Pd < S and EIU < BIU , and when the FMOHR increases, then there is possibly an exception to the general rule that ACI < VCI.** If the increase in the FMOHR exactly offsets the decrease in inventory units then ACI = VCI. If the FMOHR increases from the previous period to the current period more than offsets the decrease in inventory units, then ACI < VCI.

The three statements generalize to a summary: Given a FIFO cost flow assumption, when a change in the FMOHR moves against the change in inventory units, then exceptions to the general rules about the relationship of ACI and VCI can occur.

Weighted Average Cost Flow, Income, Inventory, and Overhead Rates

Analysis of the weighted average cost flow (WA) is consistent with the outcomes for FIFO. Now under WA, CR is a moving weighted average of the current period costs and production and previous period fixed manufacturing costs:

$$CR = \frac{FMOH + (BIU)(PR)}{Pd + BIU}$$

where Pd = current period production in units, FMOH = total fixed manufacturing costs incurred for the current period, and PR is now a moving average overhead rate from the prior period. The change in fixed manufacturing overhead in inventory is then noted as CR (EIU) - PR (BIU) as with the other cost flows.

In the case of WA, the interpretation of the changes in inventory and overhead rates is parallel to FIFO. As the BIU are assumed to pass through the to the Cost of Goods sold, they are transferred at the updated rate, CR. Thus, the EIU are at an updated rate computed as of the end of the fiscal period in contrast to the PR, and the analysis follows the same process as found in Exhibits 3, 4, and 5.

While the mechanical relationships of exceptions under FIFO and WA are the same, the frequency of exceptions under WA would possibly be less than under FIFO. The averaging of the entire current period's fixed overhead with the lesser amount of overhead contained in the beginning inventories would result in a smaller proportional in CR and PR relative to FIFO. Thus, relative to FIFO, there would be a smaller frequency of exceptions under WA.

Extension to Accounting Instructional Resources

Extension to accounting instruction involves identifying and creating educational materials that parallel the kinds of business changes that might lead to such exceptions. The situations presented below represent to general situations: increases in capacity; and, decreases in capacity. In this study, two problems and solutions are presented.

(1) A manufacturing company has excess capacity, some of which is inefficient technology and some of which is more modern and more efficient technology. The modern technology has sufficient capacity to replace the inefficient technology which is becoming increasingly expensive to operate. The inefficient technology is replaced, cutting substantially the overhead cost of production, and thus cutting the overhead rate. At the same time inventory unit levels increase slightly.

(2) A manufacturing company needs additional capacity to meet projected increases in demand, but increases its capacity beyond the next period needs for growth, anticipating growth in demand over

several periods. The company sets its planned production meet anticipated sales while maintaining inventory unit levels at a constant or only slightly reduced level. However, the company sees increased overhead rates due to the use of current master budget level as the denominator level rises due to the increase in capacity beyond the immediate future needs.

Below, in body of the study, a problem related to trimming excess capacity is presented and discussed. That situation of excess capacity is demonstrated with discussion in Exhibits 6A - 6F for the Mahler Company. The text of the problem has been summarized for presentation here, and can be reworded to suit the needs of any particular instructor's preferences.

Appendix A contains the text and solutions in a similar format for the second situation involving the expansion of capacity. There, for convenience and comparability of presentation, the components of the problem are arranged in a series of exhibits that parallel the Mahler Company.

The text of the problem for Mahler Company is presented in Exhibit 6A, followed by the requirements in 6B. The structure of the problem is modified so that the presentation of the period-by-period data is succinct for discussion in the context of an article presenting the concept.

The two opening paragraphs provide the context for the problem and information about the cost accounting system. A chart of data gives the necessary problem data in an organized format. That chart can be presented in an alternative form embedded in more elaborate prose as desired by any instructor using the problem.

Variations of the amount of information in the problem can be created. For instance, one of the pieces of information regarding sales, inventory, and production can be withheld, requiring the student to determine the missing value. This has been done in a testing context and did not create a difficulty since the relationships are present in the analysis of the analysis of the finished goods account.

Exhibit 6A shows that the problem deals with financial results for fiscal years, 2007 and 2008. However, data for ending inventory for 2006 are provided as the basis for the beginning inventory in 2007. The year 2007 demonstrates a period in which a decline in inventory is more than offset by an increase in the standard overhead rate due to rapidly increasing fixed costs for a technologically outdated manufacturing plant.

The increased budgeted fixed overhead costs in 2007 correspond to the condition of the rapidly increasing costs associated with the technologically outdated plant. The decline in 2008 corresponds to the closing of the outdated plant. Actual fixed manufacturing costs are set to yield a favorable variance in 2007 and an unfavorable variance in 2008.

For simplicity, overhead rates are calculated using units of output as the allocation base, and the denominator level is the master budget level (which in the context of the problem is planned sales). In the year 2007, the production is 1000 units short of the planned sales and production, while sales are at the predicted level, leading to a decline in the inventory unit level of 1,000 units. In 2008, the production is 1,000 units over plan, but the sales fall short of plan by 5,000 units, yielding an increase in the inventory unit level of 6,000 units.

Because the emphasis with respect to the variable cost variance is its disposition, the variable manufacturing costs are combined into a single rate. This rate is set as a cost per unit of output. Using the unit of output as the base simplifies the problem. Using one combined rate creates a quickly calculated variance, which is the flexible budget variance. The point of the problem is not in breaking down the variances, but instead their association with the cost object, cost of goods sold, to which the variable cost variance and the two overhead variances are closed under absorption costing. Under variable costing, it is then seen that only the variable cost variance is closed to the cost of goods sold; the fixed overhead variance is included with the fixed overhead cost as a part of the expense, while the production volume variance does not exist.

EXHIBIT 6A
Mahler Company Problem: Absorption and variable costing compared

During 2006 and 2007, the Mahler Company produced its products in three plants. Mahler's oldest plant, Plan A, was old technologically outdated. Its other two plants, B and C, were modern and cost efficient as well as having the considerable more production capacity between the two plants than was necessary for current and future projected demands. As fixed costs of operations began to rise sharply in 2007 in Plant A, Mahler decided to close that plant in an effort to cut the fixed costs of operation, extending the hours of production in the other two. As expected, management found that the capacity in the two remaining plants would be adequate for the extended production time with marginal increases in fixed manufacturing cost in those plants. As such it closed the most expensive plant and consolidated its operations at the beginning of 2008.

Internally, Mahler Company uses a variable costing system based on standard costs. For external financial statements it uses an absorption-costing system based on standard costs. In its accounting system, Mahler keeps track of three variances: a variable cost variance which covers all variable costs; a fixed manufacturing overhead spending variance, and a fixed manufacturing overhead production volume variance. No variances are recorded for selling and administrative costs. All variances are closed against the cost of goods sold at the end of the period. Mahler uses the FIFO inventory costing method.

The variable manufacturing costs and the variable selling and administrative costs are on a per output unit basis. The variable manufacturing costs are a combined average cost per unit which includes variable materials, variable labor, and variable overhead. Fixed manufacturing costs use output units as the denominator level, which is measured as the master budget level for each fiscal year.

Below are data for the years 2006 through 2008 are compiled as to budgeted levels and actual levels.

Fiscal Year	2006	2007	2008
Selling Price per unit	$6.00	$7.00	$8.00
Sales in units		100,000	105,000
Beginning inventory in units	10,000	10,000	9,000
Ending inventory in units	10,000	9,000	15,000
Production		99,000	111,000
Budgeted fixed manufacturing cost	$190,000	$230,000	$151,800
Denominator Value	100,000	100,000	110,000
Fixed selling and administrative costs	$75,000	$80,000	$85,000
Variable selling and administrative per unit	$1.00	$1.05	$1.10
Standard variable manufacturing costs per unit:	$2.50	$2.60	$2.70
Actual total variable manufacturing cost per unit		$2.55	$2.80
Actual total fixed manufacturing cost	$195,000	$225,000	$154,000

The rates for variable manufacturing and variable selling and administrative costs are set at slightly rising amounts to correspond to a moderately rising price index. Actual rates are set to yield a favorable variance in 2007 and unfavorable variance in 2008.

Exhibit 6B presents the requirements for the problem. The five requirements will be discussed in their order with references to subsequent exhibits with display the solution to the each. The first three requirements are standard in the sense of requiring cost per unit under both techniques and in requiring financial statements for both techniques for both years. The fourth requirement which includes a reconciliation of the fixed cost expensed under each technique (for both years separately) and of the change in fixed costs in inventories is not usual with respect to the cost expensed. The fifth requirement creates a reevaluation that demonstrates the possible effect that recalculating to the actual fixed overhead rate might have on the possibility of exceptions.

The reconciliation (shown below in Exhibit 6G) requires the integration of the fixed overhead spending variance and the production volume variance into consideration of the fixed cost expensed as part of the

cost of goods sold. The initial instruction is to assume that variances are closed to the cost of goods sold. This emphasizes for that the standard cost of goods is not the only source of fixed manufacturing cost that is expensed, but also sets up the circumstances for demonstrating the effect of the actual rate in comparison to standard rates in the role of creating exceptions (See requirement 5 and Exhibit 6H).

EXHIBIT 6B
Mahler Company Problem: Requirements

1. Compute the standard cost per unit under variable costing and under absorption costing.

2. Prepare comparative absorption-costing income statements for 2007 and 2008, assuming that all variances are written off directly at year-end as an adjustment to Cost of Goods Sold. Show these variances as line items on the income statement as additions or deductions from the standard cost of goods sold as appropriate.

3. Prepare comparative variable-costing income statements for 2007 and 2008, assuming that the variable cost variance is written off directly at year-end as an adjustment to Cost of Goods Sold. Show this variance as a line item on the income statement as an addition or deduction from the standard cost of goods sold. The fixed manufacturing spending variance is to be included as part of the actual fixed manufacturing overhead.

4. Prepare a reconciliation of absorption and variable costing income for each of 2007 and 2008 with respect to the difference in the two income measures, the fixed cost expensed, and the change in fixed costs in inventory.

5. Compute the cost per unit at actual costs per unit for the years 2007 and 2008 and use the recomputed costs to reconcile the fixed cost expensed under absorption and variable costing and to compute the change in fixed costs in inventory. Does the relationship between absorption costing income change compared to parts 1 – 3? If so, in what way(s)?

The answer to requirement 1 is found in Exhibit 6C. The standard cost is computed for both absorption and variable costing as the basis for the remainder of the problem. Being a separate requirement, and the first, it provides a convenient reference for three key figures the remainder of the problem: the variable cost per unit, the absorption cost per unit, and the fixed manufacturing cost per unit.

EXHIBIT 6C
Mahler Company Problem: Solution to Requirement 1

Part 1.	2006	2007	2008
Variable Manufacturing Cost per Unit	$2.50	$2.60	$2.70
Absorption Manufacturing Cost per Unit			
Variable Manufacturing Cost per Unit	$2.50	$2.60	$2.70
Fixed Manufacturing Cost per Unit	1.90	2.30	1.38
Absorption Manufacturing Cost per Unit	$4.40	$4.90	$4.08
Budgeted fixed manufacturing cost	$190,000	$230,000	$151,800
Denominator Value in units	100,000	100,000	110,000
Fixed overhead application rate per unit	$1.90	$2.30	$1.38

Recognizing those key figures from requirement 1 and combining them with the sales, production, and inventory unit data, the student can readily compute the variances needed for part 2 as well as completing the reconciliations required in requirement 4. These variance calculations (for variable cost

variance, fixed overhead spending variance, and production volume variance) are shown in Exhibit 6D. In using this problem in a class discussion, it is helpful to some students to point out that they can indeed make those variance computations as well as the last two portions of the reconciliation in requirement 4 prior to preparing the statements. In the context of a student solution these variances will be footnotes to the statements when they are created. The variance computations are presented separately here to facilitate separate evaluation by the reader, but are also presented first in class discussion as recommended above.

Requirements 2 and 3 are the for preparation of the two forms of income statements (Exhibits 6E and 6F) for each of the two years 2007 and 2008. There are two primary additions to the preparation of the statements compared to typical problems in extant texts. First is the inclusion of three variances as opposed to the singular production volume variance. Second is the inclusion of the layering of the cost of goods sold under the FIFO cost flow assumption.

EXHIBIT 6D
Mahler Company Problem: Solution to Requirement 2
Variance Computations

Part 2: Variance footnotes to Absorption Costing Statements.		
Note 3	2007	2008
Variable flexible budget cost variance:		
Actual variable costs per unit (given)	$2.55	$2.80
Budgeted variable costs per unit (from Exhibit (C)	2.60	2.70
Variance per unit (F)U	($0.05)	$0.10
Production (given)	99,000	111,000
Variable cost variance (F)U	($4,950)	$11,100
Fixed manufacturing OH Spending Variance:		
Actual FMOH (given)	$225,000	$154,000
Budgeted FMOH (from Exhibit (C)	230,000	151,800
FMOH Spending Variance (F)U	($5,000)	$2,200
Note 4	2007	2008
Denominator Volume (from Exhibit (C)	100,000	110,000
Production (given)	99,000	111,000
Production deficiency (excess)	1,000	(1,000)
Fixed overhead application rate per unit (from Exhibit (C)	$2.30	$1.38
Production volume variance (F)U	$2,300.00	($1,380.00)

Using the three variances provides the student with the opportunity to observe directly the association of the variances the particular cost components when preparing the statements. When the transition is made from the absorption format to the variable costing income format, the student sees the dispersion of the three variances from the single item (cost of goods sold) under the absorption approach. For in the variable costing approach, only the variable cost variance is associated with the variable cost of goods sold, while the fixed overhead spending variance is associated with the period's fixed cost deduction. Of course, the production volume variance disappears since it does not exist under variable costing.

The use of two years of data in the problems allows for a greater range of training. It is true that each year could serve as a stand alone problem. However, given the FIFO cost flow and associated layering of inventory units, the two years provides a method to establish one base year for a two year sequence. Further, the two year problem can be split into two separate problems with outcome pf the first full year's operation (2007) providing the preface for the second problem (2008). This has been tried and found useful in enhancing the students' initial grasp of the problem components.

EXHIBIT 6E
Mahler Company Problem: Solution to Requirement 2
Absorption Costing Income Statements

Part 2.

MAHLER Company, FIFO
Absorption Costing Income Statement
For the Year Ended December 31, 2007 and 2008

	2007	2008
Sales (Note 1)	$700,000	$840,000
Absorption cost of goods sold at standard (Note 2)	485,000	435,780
Variable manufacturing cost variance (Note 3) (F)U	(4,950)	11,100
FMOH Spending Variance (Note 3) (F)U	(5,000)	2,200
Production volume variance (Note 3) (F)U	2,300	(1,380)
Cost of goods sold adjusted for variances	477,350	447,700
Gross margin	222,650	392,300
Selling and administrative costs		
Variable (Note 5)	105,000	115,500
Fixed	80,000	85,000
Total selling and administrative costs	185,000	200,500
Operating income	$37,650	$191,800

Note 1	Sales =	Units X	SP
2007	700,000	100,000	$7.00
2008	840,000	105,000	$8.00

Note 2			Abs CGS
2007	AbsCGS=	Units X	/unit
2006	44,000	10,000	$4.40
2007	441,000	90,000	$4.90
	485,000		

			Abs CGS
2008	AbsCGS=	Units X	/unit
2007	44,100	9,000	$4.90
2008	391,680	96,000	$4.08
	435,780		

Note 3 See Part 3, Exhibit 6D.

			Var S&A
Note 5	VarS&A=	Units X	/unit
2007	105,000	100,000	$1.05
2008	115,500	105,000	$1.10

EXHIBIT 6F
Mahler Company Problem: Solution to Requirement 3
Variable Costing Income Statements

Part 3.
MAHLER Company, FIFO
Variable Costing Income Statement
For the Year Ended December 31, 2007

	2007	2008
Sales (Note 1)	$700,000	$840,000
Variable cost of goods sold (Note 2)	259,000	282,600
Variable manufacturing cost variance (Note 3) (F)U	(4,950)	11,100
Variable cost of goods sold adjusted for variances	254,050	293,700
Variable selling and administrative (Note 4)	105,000	115,500
Total variable costs	359,050	409,200
Contribution margin	340,950	430,800
Fixed costs:		
Manufacturing:		
Flexible Budget	230,000	151,800
FMOH Spending Variance (Note 3) (F)U	(5,000)	2,200
Fixed manufacturing cost (Actual)	225,000	154,000
Selling and administrative	80,000	85,000
Total fixed costs	305,000	239,000
Operating income	$35,950	$191,800

Note 1	Sales =	Units X	SP
2007	700,000	100,000	$7.00
2008	840,000	105,000	$8.00

Note 2	VarCGS=	Units X	Var CGS /unit
2006	25,000	10,000	$2.50
2007	234,000	90,000	$2.60
	259,000	100,000	
2007	23,400	9,000	$2.60
2008	259,200	96,000	$2.70
	282,600	105,000	

Note 3 See Exhibit 6D under Absorption Costing statements.

Note 4	VarS&A=	Units X	Var S&A /unit
2007	105,000	100,000	$1.05
	115,500	105,000	$1.10

As seen in Exhibit 6G (which is the solution to Requirement 4), a comparison and analysis of the income under the two methods in each year demonstrate two “exceptional” situations. For 2007, the inventory units have declined, but absorption costing income is larger than variable costing income. For 2008, the inventory units have increased, but absorption costing income is equal to variable costing income. As will be seen in the reconciliations of requirement 4, the effect of the overhead rate changes have offset the inventory unit changes.

In the first part of Exhibit G, the operating income under the two methods is presented for reference. Examining year 2007, despite the decrease in inventory units in 2007, the absorption costing income is higher than the variable costing income by $1700. Looking to the last four lines of the solution, the analysis of the fixed cost in inventories shows that the decline of 1,000 units was more than offset by an increase in the overhead rate from $1.90 to $2.30. This resulted in an increase in fixed cost of $1700 in inventories rather than a decline, as would have been indicated by the general expectations.

EXHIBIT 6G
Mahler Company Problem: Solution to Requirement 4
Reconciliation of Absorption and Variable Costing Income

Part 4.									
MAHLER Company, FIFO									
Reconciliation of Absorption and Variable Costing Incomes									
Years Ended 2007 & 2008									
Operating income		**2007**					**2008**		
Absorption costing		37,650					191,800		
Variable costing		35,950					191,800		
Difference		1,700					0		
FMOH charged to expense under Absorption Costing									
		Fixed		Cost/			Fixed		Cost/
Fixed costs at standard :		Cost	Units	unit			Cost	Units	unit
Previous year FG's	06	19,000	10,000	1.90		07	20,700	9,000	2.30
Current year FG's	07	207,000	90,000	2.30		08	132,480	96,000	1.38
Standard fixed cost in CGS		226,000					153,180		
FMOH Spending Variance (F)U		(5,000)					2,200		
Production volume variance (F)U		2,300					(1,380)		
Fixed cost in CGS		223,300					154,000		
FMOH charged to expense under Variable Costing									
Fixed cost for the current year		(225,000)					(154,000)		
Difference		(1,700)					0		
		Fixed		Cost/			Fixed		Cost/
Fixed cost in inventories		Cost	Units	unit			Cost	Units	unit
Ending inventories	07	20,700	9,000	2.30		08	20,700	15,000	1.38
Beginning inventories	06	19,000	10,000	1.90		07	20,700	9,000	2.30
Change in fixed cost		1,700					0		

The center of the solution (Exhibit 6G), titled 'FMOH charge to expense under Absorption Costing," shows that the amount of the standard fixed cost for units sold that is expensed under absorption costing in 2007 ($226,000) is more than the period's fixed cost expensed under variable costing ($225,000). However, the fixed spending variance and the production volume variances which are closed to the cost of goods sold net as favorable variances and cause the fixed overhead expensed under absorption costing to be less than under variable costing. This difference is the amount that would be allocated across production to adjust the standard rates to the actual rates. The possibility that allocation of the variances to create

actual rates may lead to a different outcome than standard rates will be addressed in Exhibit 6H after looking at the 2008 results based on standard overhead rates.

Looking again at Exhibit 6G, despite the increase in inventory units in 2008, the absorption costing income is equal to the variable costing income. Looking to the last four lines of the solution, the analysis of the fixed cost in inventories shows that the increase of 1,000 units was just than offset by a decrease in the overhead rate from $2.30 to $1.38. Thus, there has been no change in the fixed cost in inventories despite the increase in inventory level.

In the center of Exhibit 6G, the amount of the standard fixed cost expensed under absorption costing in 2008 ($153,180) is less than the period's fixed cost expensed under variable costing ($154,000). In 2008, the difference is in the fixed spending variance and the production volume variances is negative and when closed to the cost of goods sold brings the expensed fixed cost up to that of the variable costing approach. Again in 2008, there is the possibility that adjustment of the overhead to the actual rate might lead to a reversion to an outcome that is consistent with the general expectations.

In Exhibit 6H, Panel 1, the fixed manufacturing overhead rate has been adjusted from the standard rate to the actual rate. This is accomplished by unitizing the production volume variance and the spending variance, then adding them to the standard rate. Thus, the solution has been redesigned to show whether the relationship between ACI and VCI differs depending on whether standard or actual rates are used.

EXHIBIT 6H, Panel 1
Mahler Company Problem: Solution to Requirement 5
Reconciliation of Absorption and Variable Costing Income at Actual Rates

Part 5.

	2006	2007	2008
Fixed OH Spending Variance:			
Actual FMOH	$195,000	$225,000	$154,000
Budgeted FMOH	190,000	230,000	151,800
FMOH Spending Variance (F)U	$5,000	($5,000)	$2,200
Production volume variance	2006	2007	2008
Denominator Volume	100,000	100,000	110,000
Production	100,000	99,000	111,000
Production deficiency (excess)	0	1,000	(1,000)
Fixed overhead rate per unit	$1.90	$2.30	$1.38
Production volume variance (F)U	$0.00	$2,300.00	($1,380.00)
Actual Cost Fixed Overhead Rate			
Standard Absorption Cost	$1.90	$2.30	$1.38
PVV effect (PVV÷Production)	0.00	$0.02	($0.01)
SV Effect (SV÷Production)	0.05	($0.05)	$0.02
Actual Cost Fixed Overhead	1.95	$2.27	$1.39

Then as shown in Exhibit 6H, Panel 2, in 2007 the adjustment to the actual rate does not reverse the exception to the general expectation. The variances are not large enough to offset the effect of the period to period change in the standard rates. This provides an example in which changes in both the standard and actual rates result in an exception to the general expectation.

In 2008, the adjustment to the actual rate does reverse the exception to the general expectation. The variances are large enough to offset the effect of the period to period change in the standard rates, bringing the change in fixed overhead back to consistency with the general expectations. Thus, 2008

provides an example in which the relationship of ACI and VCI is sensitive to whether standard or actual rates are used to value the inventories.

EXHIBIT 6H, Panel 2
Mahler Company Problem: Solution to Requirement 5
Reconciliation of Absorption and Variable Costing Income at Actual Rates

Operating income	2007	2008
Absorption costing	36,455	194,106
Variable costing	35,500	193,750
Difference	955	356

FMOH charged to expense under Absorption Costing								
Costs at standard :		Fixed Cost	Units	FixCost /unit		Fixed Cost	Units	FixCost /unit
CGS, previous year FG's	2006	19,500	10,000	1.95	2007	20,455	9,000	2.27
CGS, current year FG's	2007	204,545	90,000	2.27	2008	133,189	96,000	1.39
Total fixed cost in CGS		224,045				153,644		
FMOH charged to expense under Variable Costing								
Total fixed cost incurred		(225,000)				(154,000)		
Difference		(955)				(356)		
Fixed cost in inventories		Fixed Cost	Units	FixCost /unit		Fixed Cost	Units	FixCost /unit
Ending inventories	2007	20,455	9,000	2.27	2008	20,811	15,000	1.39
Beginning inventories	2006	19,500	10,000	1.95	2007	20,455	9,000	2.27
Change in fixed cost		955				356		

Appendix A presents a second problem, the Energy Company, which in contrast to Mahler, relates to an expansion of capacity between the second and third years. The reference year is 2006 and the active years are 2007 and 2008. In 2007, the company pushes its budgeted production to the 2007 capacity, driving overhead rates down, but slightly increasing inventory units. Then in 2008, the capacity and capacity costs are increased, building excess capacity for anticipated future sales growth. However, 2008 budgeted sales and production are well below the excess capacity, creating an increase in overhead rates. Inventories for that year are controlled and decrease from the 2007 level. Those circumstances for 2007 and 2008 lead to the creation of exceptions to the general expectations for the difference in ACI and VCI. For Energy Company in 2007, the small buildup of inventories in combination with a drop in the overhead rate as the company operates closer to capacity creates an exception in which ACI < VCI despite the increase in inventory units. In 2008, there is a draw down of inventory units combined with a marked increase in capacity cost and in the overhead rate sufficient to cause ACI > VCI despite the decrease in inventory units.

SUMMARY

Looking back to the analysis of the three cost flow assumptions, consistency with the general expectations and exceptions to them can be succinctly summarized:

For a LIFO cost flow assumption, the general expectations always hold true without respect to overhead rate changes.

For FIFO and WA cost flow assumptions, consistency or inconsistency with the general expectations depends on the direction and magnitude of the change in the overhead rate in relation to the direction and magnitude of the inventory level change.

The general expectation that the sign of the difference, ACI – VCI, is directly related to the sign of the change in inventory unit levels is true when the the sign of any change in the overhead rate is consistent with the sign of the inventory unit change.

Exceptions to the general expectation that ACI – VCI is directly related to the sign of EIU – BIU can occur when the overhead rate changes against the change in inventory units.

If the change in the FMOHR exactly offsets the change in inventory units then ACI = VCI.

If a decline in the FMOHR more than offsets an increase in inventory units then ACI < VCI in contrast to the expected income difference.

If an increase in the FMOHR more than offsets a decrease in inventory units then ACI > VCI in contrast to the expected income difference.

Overall, the study has demonstrated systematically the source and extent of exceptions to the general relationship difference between absorption costing and variable costing income in relation to inventory unit changes. The study has shown that exceptions to the general expectations take place when the overhead rate moves against the inventory unit change under FIFO and Weighted Average cost flow assumptions.

These findings about these possible exceptions have been extended to instructional resources in the presentation of two problems that provide a broader context for teaching relationships between absorption costing and variable costing statements. This broader context includes the conditions under which such exceptions may be created. These conditions are demonstrated and presented in this study as two problems, which can be used as is or modified for use by accounting instructors. Additionally, the effect of restating standard overhead rates to actual overhead rates is incorporated.

REFERENCES

Adjinkya, A., R. Atiase, and L. S. Bamber. 1986. Absorption versus Direct Costing: Income Reconciliation and Cost-Volume-Profit Analysis. *Issues in Accounting Education* (Fall): 268-292.

Appendix A

EXHIBIT 7A
Energy Company Problem: Absorption and variable costing compared

The Energy Company produces and sells a single product, the solar converter unit. During the last three years, the company has seen a substantial increase in the demand for its product. Following are sales and production data for the last two years, 2007 and 2008, with partial data for 2006.

	2006	2007	2008
Selling Price per unit	$42.00	$44.00	$46.00
Sales in units		29,000	45,000
Beginning inventory in units		6,000	8,000
Ending inventory in units	10,000	8,000	4,000
Production	18,000	31,000	41,000

Relative to 2006 and 2007, the company expanded its productive capacity drastically for 2008 in order to meet the increases in perceived demand. Although increases in productive capacity have resulted in increased fixed manufacturing costs, there have been reductions in labor and variable overhead costs on a per unit basis. During 2007, fixed selling costs temporarily increased due to certain promotional procedures. The company uses its master budget volume as its denominator volume,. Cost data is summarized below.

	2006	2007	2008
Budgeted fixed manufacturing cost	$126,000	$135,000	$390,000
Denominator value	18,000	30,000	45,000
Actual fixed manufacturing cost	$124,000	$133,000	$395,000
Actual fixed selling and administrative costs	$100,000	$230,000	$190,000
Standard variable manufacturing costs per unit	$24.00	$24.90	$22.20
Actual selling and administrative cost per unit		$ 1.00	$ 1.20
Actual variable manufacturing costs per unit	$23.50	$24.90	$22.20

At the end of 2006, Energy saw that there would likely be a significant increase in the demand for its product during 2007 and saw the potential for very significant increases in demand for its product in subsequent years. During 2007, its maximum potential for practical production was 31,000 to 32,000 units. Given its projected demands, the company set budgeted production at 30,000 units. Therefore it constructed additional facilities that came on line at the beginning of 2008. During 2008 the company instituted a policy to reduce their beginning inventories by 50%.

Internally, Energy Company uses a variable costing system based on standard costs. For external financial statements it uses an absorption-costing system based on standard costs. In its accounting system, Energy keeps track of three variances: a variable cost variance which covers all variable costs; a fixed manufacturing overhead spending variance, and a fixed manufacturing overhead production volume variance. No variances are recorded for selling and administrative costs. All variances are closed against the cost of goods sold at the end of the period. Energy uses the FIFO inventory costing method. Below are various operating data for the years ended 2006, 2007, and 2008.

The variable manufacturing costs and the variable selling and administrative costs are on a per output unit basis. The variable manufacturing costs are a combined average cost per unit which includes variable materials, variable labor, and variable overhead. Fixed manufacturing costs use output units as the denominator level, which is measured as the master budget level for each fiscal year and which will grow as perceived demand increases.

EXHIBIT 7B
Energy Company Problem: Requirements

1. Compute the standard cost per unit under variable costing and under absorption costing.

2. Prepare comparative absorption-costing income statements for 2007 and 2008, assuming that all variances are written off directly at year-end as an adjustment to Cost of Goods Sold. Show these variances as line items on the income statement as additions or deductions from the standard cost of goods sold as appropriate.

3. Prepare comparative variable-costing income statements for 2007 and 2008, assuming that the variable cost variance is written off directly at year-end as an adjustment to Cost of Goods Sold. Show this variance as a line item on the income statement as an addition or deduction from the standard cost of goods sold. The fixed manufacturing spending variance is to be included as part of the actual fixed manufacturing overhead.

4. Prepare a reconciliation of absorption and variable costing income for each of 2007 and 2008 with respect to the difference in the two income measures, the fixed cost expensed, and the change in fixed costs in inventory.

5. Compute the cost per unit at actual costs per unit for the years 2007 and 2008 and use the recomputed costs to reconcile the fixed cost expensed under absorption and variable costing and to compute the change in fixed costs in inventory. Does the relationship between absorption costing income change compared to parts 1 – 3? If so, in what way(s)?

EXHIBIT 7C
Energy Company Problem: Solution to Requirement 1

Part 1.	2006	2007	2008
Variable Manufacturing Cost per Unit	$24.00	$24.70	$22.50
Absorption Manufacturing Cost per Unit			
Variable Manufacturing Cost per Unit	$24.00	$24.70	$22.50
Fixed Manufacturing Cost per Unit	7.00	4.50	8.67
Absorption Manufacturing Cost per Unit	$31.00	$29.20	$31.17
Budgeted fixed manufacturing cost	$126,000	$135,000	$390,000
Denominator Value in units	18,000	30,000	45,000
Fixed overhead application rate per unit	$7.00	$4.50	$8.67

EXHIBIT 7D
Energy Company Problem: Solution to Requirement 2
Variance Computations

Part 2.

Note 3	2007	2008
Variable flexible budget cost variance:		
Actual variable costs per unit	$24.90	$22.20
Budgeted variable costs per unit	24.70	22.50
Variance per unit (F)U	$0.20	($0.30)
Production	31,000	38,000
Variable cost variance (F)U	$6,200	($11,400)
Fixed manufacturing OH Spending Variance:		
Actual FMOH	$133,000	$395,000
Budgeted FMOH	135,000	390,000
FMOH Spending Variance (F)U	($2,000)	$5,000

Production volume variance:	2007	2008
Denominator Volume	30,000	40,000
Production	31,000	38,000
Production deficiency (excess)	(1,000)	2,000
Fixed overhead application rate per unit	$4.50	$9.75
Production volume variance (F)U	($4,500.00)	$19,500.00

EXHIBIT 7E
Energy Company Problem: Solution to Requirement 2
Absorption Costing Income Statements

Part 2.
ENERGY Company, FIFO
Absorption Costing Income Statement
For the Year Ended December 31, 2007 and 2008

	2007	2008
Sales (Note 1)	$1,276,000	$1,932,000
Absorption cost of goods sold at standard (Note 2)	857,600	1,330,100
Variable manufacturing cost variance (Note 3) (F)U	6,200	(11,400)
FMOH Spending Variance (Note 3) (F)U	(2,000)	5,000
Production volume variance (Note 3) (F)U	(4,500)	19,500
Cost of goods sold adjusted for variances	857,300	1,343,200
Gross margin	418,700	588,800
Selling and administrative costs		
Variable (Note 5)	34,800	52,500
Fixed	230,000	190,000
Total selling and administrative costs	264,800	242,500
Operating income	$153,900	$346,300

Note 1	Sales =	Units X	SP
2007	1,276,000	29,000	$44.00
2008	1,932,000	42,000	$46.00

Note 2

2007	AbsCGS=	Units X	Abs CGS/unit
2006	186,000	6,000	$31.00
2007	671,600	23,000	$29.20
	857,600		

2008	Abs CGS=	Units X	Abs CGS /unit
2007	233,600	8,000	$29.20
2008	1,096,500	34,000	$32.25
	1,330,100		

Note 3 See Part 3, Note 3.
Note 4 See Part 3, Note 4.

Note 5	VarS&A=	Units X	Var S&A /unit
2007	34,800	29,000	$1.20
2008	52,500	42,000	$1.25

EXHIBIT 7F
Energy Company Problem: Solution to Requirement 3
Variable Costing Income Statements

Part 3.
ENERGY Company, FIFO
Variable Costing Income Statement
For the Year Ended December 31, 2007

	2007	2008
Sales (Note 1)	$1,276,000	$1,932,000
Variable cost of goods sold (Note 2)	712,100	962,600
Variable manufacturing cost variance (Note 3) (F)U	6,200	(11,400)
Variable cost of goods sold adjusted for variances	718,300	951,200
Variable selling and administrative (Note 4)	34,800	52,500
Total variable costs	753,100	1,003,700
Contribution margin	522,900	928,300
Fixed costs:		
Manufacturing:		
Flexible Budget	135,000	390,000
FMOH Spending Variance (Note 3) (F)U	(2,000)	5,000
Fixed manufacturing cost (Actual)	133,000	395,000
Selling and administrative	230,000	190,000
Total fixed costs	363,000	585,000
Operating income	$159,900	$343,300

Note 1	Sales =	Units X	SP
2007	1,276,000	29,000	$44.00
2008	1,932,000	42,000	$46.00

Note 2	Var CGS=	Units X	Var CGS /unit
2006	144,000	6,000	$24.00
2007	568,100	23,000	$24.70
	712,100	29,000	
2007	197,600	8,000	$24.70
2008	765,000	34,000	$22.50
	962,600	42,000	

Note 3 See Note 3 under Absorption Costing statements.

Note 4	Var S&A=	Units X	Var S&A /unit
2007	34,800	29,000	$1.20

EXHIBIT 7G
Energy Company Problem: Solution to Requirement 4
Reconciliation of Absorption and Variable Costing Income

Part 4.
ENERGY Company, FIFO
Reconciliation of Absorption
and Variable Costing Incomes
For Years 2007 & 2008

Operating income		2007					2008		
Absorption costing		153,900					346,300		
Variable costing		159,900					343,300		
Difference		(6,000)					3,000		
FMOH charged to expense under Absorption Costing				Cost/					Cost/
Fixed costs at standard :		FixedCost	Units	unit			FixedCost	Units	unit
Previous year FG's	2006	42,000	6,000	7.00		2007	36,000	8,000	4.50
Current year FG's	2007	103,500	23,000	4.50		2008	331,500	34,000	9.75
Total standard fixed cost in CGS		145,500					367,500		
FMOH Spending Variance (F)U		(2,000)					5,000		
Production volume variance (F)U		(4,500)					19,500		
Fixed cost in CGS		139,000					392,000		
FMOH charged to expense under Variable Costing									
Fixed cost for the current year		(133,000)					(395,000)		
Difference		6,000					(3,000)		
				Cost/					Cost/
Fixed cost in inventories		Fixed Cost	Units	unit			Fixed Cost	Units	unit
Fixed cost in ending inventories	2007	36,000	8,000	4.50		2008	39,000	4,000	9.75
Fixed cost in beginning inventories	2006	42,000	6,000	7.00		2007	36,000	8,000	4.50
Change in fixed cost		(6,000)					3,000		

EXHIBIT 7H
Energy Company Problem: Solution to Requirement 5
Reconciliation of Absorption and Variable Costing Income at Actual Rates

Part 5. Modified to Actual Cost	2006	2007	2008
Budgeted fixed manufacturing cost	$126,000	$135,000	$390,000
Denominator Value in units	18,000	30,000	45,000
Fixed overhead application rate per unit	$7.00	$4.50	$8.67
Actual Cost Fixed Manufact. Overhead			
Standard Absorption Cost	$7.00	$4.50	$8.67
PVV effect (PVV÷Production)	0.00	($0.15)	$0.85
SV Effect (SV÷Production)	(0.11)	($0.06)	$0.12
Actual Cost Fixed Manufact. Overhead	6.89	$4.29	$9.64

FMOH charged to expense under Absorption Costing								
Costs at standard :		Fixed Cost	Units	FixCost /unit		Fixed Cost	Units	FixCost /unit
Fixed cost in CGS, previous year FG's	2006	41,333	6,000	6.89	2007	34,323	8,000	4.29
Fixed cost in CGS, current year FG's	2007	98,677	23,000	4.29	2008	356,680	37,000	9.64
Total standard fixed cost in CGS		140,011				391,003		
FMOH Spending Variance (F)U								
Production volume variance (F)U								
Total fixed cost in CGS		140,011				391,003		
FMOH charged to expense under Variable Costing								
Total fixed cost incurred		(133,000)				(395,000)		
Difference		7,011				(3,997)		
		Fixed		FixCost		Fixed		FixCost
Change in fixed cost in inventories		Cost	Units	/unit		Cost	Units	/unit
Ending inventories	2007	34,323	8,000	4.29	2008	38,560	4,000	9.64
Beginning inventories	2006	41,333	6,000	6.89	2007	34,323	8,000	4.29
Change in fixed cost		(7,011)				4,237		