15.963 Management Accounting and Control
Spring 2007

15.963 Managerial Accounting and Control

Spring 2007

Prof. Mozaffar Khan

MIT Sloan School of Management

Zimmerman 12 – 1 (Rust Belt)

- Firms use standards as benchmarks, or expectations, for input prices and quantities, among other things.
- Standards are used in decision making, e.g., in budgeting, setting transfer prices, and product costing and pricing.
- Standards are also used for control, e.g., to set employee performance benchmarks.
- Standards are prevalent, especially in manufacturing firms where over 75% of firms use them in most countries.

Zimmerman 12 – 1 (Rust Belt)

- How are standards determined?
- Bottom-up methods: time and motion engineering studies; surveying managers and other employees; industry benchmarks.
- Top-down methods: e.g., target costing at IKEA and Nissan.
  - The beginning of the value chain is guided by the standards, which are subsequently 'built-in' to the product.

Zimmerman 12 – 1 (Rust Belt)

- What are some costs of standards?
- Direct costs of determining standards (time and motion studies, etc.).
- Cost of revising standards if there is rapid technological change (product and process changes).
- Behavioral distortions if there is a fixation on use of standards for control.
- Satisficing behavior.

Zimmerman 12 – 1 (Rust Belt)

- Deviations from expected (or standard) results are called variances.
- Variances are examined for control: examine reasons for the variances, and take corrective action.
- Variances can also be used for decision making: if the system cannot be brought under control, should it be abandoned or redesigned (e.g., drop product line or redesign product?).
- Clearly, it is important to identify why variances have occurred in order to take the right corrective action and to affix responsibility.

Zimmerman 12 – 1 (Rust Belt)

- Let us examine the different types of variances, and consider some reasons why they occur.
- Start with a budget, which contains forecasted prices and quantities of outputs and inputs. The top line (revenue) uses the forecasted output volume. This is called a static budget, and is prepared at the beginning of the budget period.

Zimmerman 12 – 1 (Rust Belt)

- At the end of the period, actual results are observed. The difference between actual operating income and the static budget operating income is called the static budget variance. We would like to understand the reasons for this variance.
- First, remove the effects of volume by preparing a flexible budget at the end of the period.
- In our example, the static budget variance is -$185k.

Zimmerman 12 – 1 (Rust Belt)

- A portion of this, the sales volume variance of -$120k (flexible budget – static budget operating income), is due purely to lower selling volume than expected.
- Examine why the lower volume occurred and who was responsible.
- The flexible budget variance is the difference between the actual and flexible budget operating incomes. If this were zero, the entire deviation from the static budget would be explained by lower volume.

Zimmerman 12 – 1 (Rust Belt)

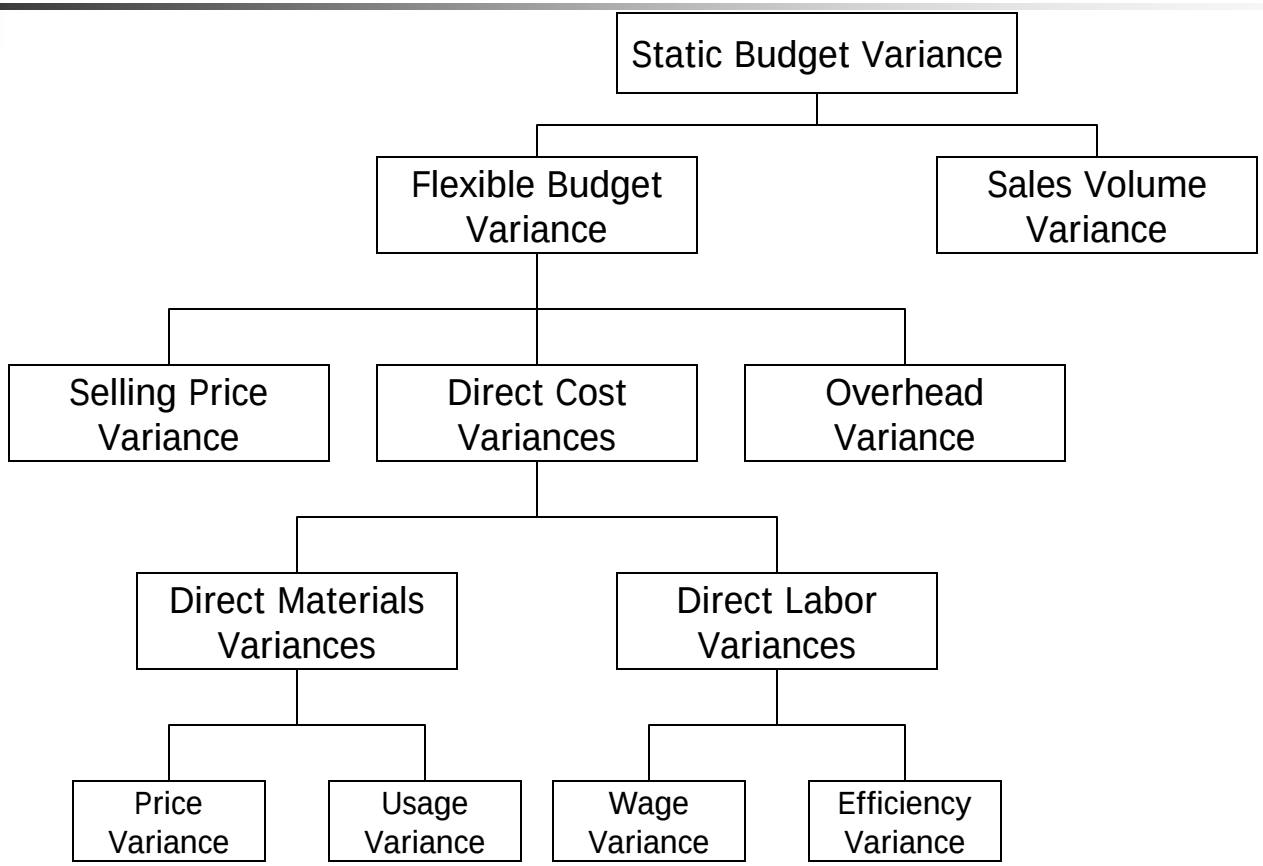
- In our example, the flexible budget variance is -$65k.
- The flexible budget variance is the sum of (or is due to) the selling-price variance and input price and quantity variances.
- The selling price variance in our example is the difference between actual and flexible budget revenues = -$50k.
- This leaves input price and quantity variances to explain the remaining $15k variance.

Standards in brackets

	Static Budget	Actual	Flexible Budget
Units sold	12000	10000	10000
Revenues (@90)	1080000	850000	900000
Variable costs			
Materials (@15)	180000	140000	150000
Labor (@10)	120000	110000	100000
Overhead (@5)	60000	55000	50000
Total VC	360000	305000	300000
Contribution Margin	720000	545000	600000
Fixed costs	300000	310000	300000
Operating income	420000	235000	300000

Static budget var	-185000
Sales volume var	-120000
Flexible budget var	-65000
Selling-price var	-50000

Variance Analysis



Zimmerman 12 – 1 (Rust Belt)

- Let us return to the Rust Belt case.
- Since no specific quantity figures are provided for installations, the total materials variance cannot be decomposed into its price and quantity components.
- Total materials variance equals the actual price paid for the materials used in installations minus the standard cost per installation times the number of installations performed.

Zimmerman 12 – 1 (Rust Belt)

- Total variance for chosen input is the sum of the price and quantity variances.
- Input price variance is (actual price-standard price)*actual quantity.
- Input quantity variance is (actual quantity-standard quantity)*standard price.
- Material variances are called price and usage variances, while labor variances are called wage and efficiency variances.
- Favorable and unfavorable variances are denoted as F and U, respectively.

Zimmerman 12 – 1 (Rust Belt)

- Materials Variance.

	$P_a \times Q_a$		P_s		s		Variance
State	$ 710,500	–	$60	x	14,500	=	$159,500F
Dewey	1,346,125	–	60 Q	x	22,250	=	11,125U
Mt. Hope	759,000	–	60	x	11,500	=	69,000U

Zimmerman 12 – 1 (Rust Belt)

- Direct labor is treated in the same manner as materials.
- However, enough data exist to disaggregate the total direct labor variance into its price and quantity components.
- W and H denote wage per hour and number of labor hours, respectively, while the subscripts a and s denote actual and standard, respectively.

Zimmerman 12 – 1 (Rust Belt)

- The total direct labor variances are:

	W_a		H_a		W_s		H_s				*Variance*
State	$11	x	11,600	-	$11.80	x	14,500	x	1	=	$43,500F
Dewey	12	x	21,138	-	11.80	x	22,250	x	1	=	8,894F
Mt. Hope	13	x	12,650	-	11.80	x	11,500	x	1	=	28,750U

Zimmerman 12 – 1 (Rust Belt)

- The percentage by which actuals vary from standards is valuable for interpretation.

	W_S x H_S	*Variance*	*Variation from Standard*
State	$171,100	$43,500F	25.4%F
Dewey	262,550	8,894F	3.4%F
Mt. Hope	135,700	28,750U	21.2%U

Zimmerman 12 – 1 (Rust Belt)

- The direct labor price variances for the Buffalo shops are:

	$_a$-W_s		H_a		Variance
State	($11.00 - $11.80)	×	11,600	=	$9,280F
Dewey	($12.00 - $11.80)	×	21,138	=	4,228U
W Mt. Hope	($13.00 - $11.80)	×	12,650	=	15,180U

Zimmerman 12 – 1 (Rust Belt)

- The direct labor <u>quantity</u> variances are:

	$_a$ - H_s		W_s		Variance
State	(11,600 - 14,5001)	×	$11.80	=	$34,220F
Dewey H	(21,138 - 22,2501)	×	11.80	=	13,122F
Mt. Hope	(12,650 - 11,5001)	×	11.80	=	13,570U

Zimmerman 12 – 1 (Rust Belt)

- The total direct cost variances for the Buffalo shops are:

	Materials	*Direct Labor*	*Total Variances*
State	$159,500F	$43,500F	$203,000F
Dewey	11,125U	8,894F	2,231U
Mt. Hope	69,000U	28,750U	40,250U

Zimmerman 12 – 1 (Rust Belt)

- How would you interpret the materials variances above?
- The State manager is spending much less on materials relative to both the standards and the other Buffalo shops.
- Since the standard costing system was implemented to encourage cost containment, State's favorable variance seems encouraging.

Zimmerman 12 – 1 (Rust Belt)

- However, since the Dewey and Mt. Hope variances tend to confirm that the standards are accurate or even somewhat low, an actual cost figure in the State Street store that is 18.3% [159,500 ÷ (60 × 14,500)] below standard should arouse some suspicion.
- Dewey's unfavorable variance is only 0.8% [$11,125 ÷ ($60 × $22,250)] above standard and probably negligible.

Zimmerman 12 – 1 (Rust Belt)

- At 10 percent [$69,000 ÷ ($60 × $11,500)] over standard, there should be some concern over Mt. Hope's commitment to meeting cost containment objectives with regard to materials purchases.
- The interpretation of the total direct labor variance yields conclusions similar to those drawn from the materials variances.

Zimmerman 12 – 1 (Rust Belt)

- State has spent suspiciously little on direct labor, Dewey is roughly in line with standards and Mt. Hope is again the big spender.
- State is spending less than the standard per direct labor hour and using far fewer hours of direct labor per installation than expected by the standard.

Zimmerman 12 – 1 (Rust Belt)

- Mt. Hope has both an unfavorable price variance and an unfavorable quantity variance; in comparison with the established standards, it is spending too much per hour of direct labor and using too many hours of direct labor per installation.

Zimmerman 12 – 1 (Rust Belt)

- Dewey pays direct labor 1.7% [($12.00 - $11.80) ÷ $11.80] above the standard rate.
- Dewey's direct labor quantity varies favorably from standard by 5% [(21,138 - 22,250) × 22,250], a number that, when considered within the context of Dewey's other variances, should probably be viewed as good cost containment rather than an indicator of trouble.

Zimmerman 12 – 1 (Rust Belt)

- The findings throughout have been relatively consistent.
- State has been able to produce for an incredibly low cost, Dewey has been at or near the established standards, and Mt. Hope has continued to be a big spender.

Zimmerman 12 – 1 (Rust Belt)

- What would you do about the variances at Dewey?
- These variances look ‘small’ and are likely due to chance.
- Attempting to correct the variances might lead to over-correction, so nothing should be done at the moment.
- The warranty information suggests that the system provides some distorted incentives to managers.

Zimmerman 12 – 1 (Rust Belt)

- Consider the percentage of jobs requiring warranty replacement for each shop:

	State	*Dewey*	*Mt. Hope*
Installations performed	14,500	22,250	11,500
Replacements caused	500	100	8
Percentage of defects	3.45%	0.45%	0.07%

Zimmerman 12 – 1 (Rust Belt)

- The Buffalo data indicate that there is a correlation between spending and quality of work.
- Care must be taken to interpret variances. What questions can we ask when variances are observed?
- First, are the standards appropriate? Conditional on appropriate standards:

Zimmerman 12 – 1 (Rust Belt)

- Why is the materials price variance favorable?
- Perhaps materials have been purchased in bulk to take advantage of price discounts, but then this increases the firm's storage costs.
- One way to mitigate this problem is to charge storage costs to manager responsible for purchasing materials.
- Perhaps low quality materials have been purchased.

Zimmerman 12 – 1 (Rust Belt)

- Why is the materials price variance unfavorable?
- Perhaps exogenous supply conditions in input market are adverse.
- Perhaps purchasing agents are enjoying private consumption at the company's expense (e.g., gifts to agents by supplier for purchasing from them).
- Purchasing agents need better training.

Zimmerman 12 – 1 (Rust Belt)

- Why is the materials quantity variance favorable?
- Perhaps less of the material is being used deliberately, e.g., 1.5 pints of coating chemicals to immerse each muffler in, rather than the standard 2 pints.
- Perhaps less of the material is being used due to poor training of workers.

Zimmerman 12 – 1 (Rust Belt)

- Why is the materials quantity variance unfavorable?
- Too much rework / scrap due to poor training of workers.
- Rework / scrap due to poor quality materials purchased by purchasing department.

Zimmerman 12 – 1 (Rust Belt)

- Why is the labor wage variance favorable?
- Has cheaper labor been substituted for skilled labor, thereby adversely affecting quality?

Zimmerman 12 – 1 (Rust Belt)

- Why is the labor wage variance unfavorable?
- Was labor mix suboptimal (skilled labor used for tasks requiring little skill)?
- Did poor quality materials necessitate rework that required more labor?
- In this case, production manager will monitor purchasing manager (mutual monitoring), by monitoring quality of materials purchased.

Zimmerman 12 – 1 (Rust Belt)

- Important control features in standard costing systems include:
- The materials price variance is isolated at purchase and recorded in a separate account. Materials inventory is debited at (actual quantity x standard cost per unit).
- This serves two purposes: (i) it makes the variance salient in a timely fashion, and (ii) it insulates downstream users (production) from this variance which they lack control over.

Zimmerman 12 – 1 (Rust Belt)

- The materials quantity variance is isolated and recorded in a separate account at the time materials are requisitioned by production. Work-in-process inventory (WIP) is debited at standard price per material unit x standard quantity per output unit x actual number of output units.
- Similarly, labor price and quantity variances are isolated and recorded in a separate account when labor is used. WIP is debited at standard wage x standard hours per output unit x actual number of output units.