

## Advanced Variance Analysis - Labour Costs

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Variance analysis provides a framework for understanding how actual costs differed from standard costs in a given time period. The P2 SPM syllabus refers to “advanced” variance analysis, so candidates need to be able to provide far more than just a basic level of analysis in both calculations and interpretation for this topic. This article will focus specifically on the variance analysis of labour costs. The “advanced” variances addressed in the article are: labour idle time variances; planning & operational variances; and situations where all of these variances are calculated simultaneously.

The example of “**Ava Ltd.**” will be used throughout the article. In the first instance, the following data is provided about Ava Ltd.’s activities for last month:

	Budget	Actual
Units of output	1,000	1,050
Wage rate	€14.00	€14.80
Direct labour hours (DLH) per unit of output	8	8.1

### **Stage 1: Basic variance analysis**

At a minimum, we would expect Ava Ltd. to calculate the following two variances:

- **Labour wage rate variance (LWRV)**

$$= (\text{Actual wage rate} - \text{Standard wage rate}) * \text{Actual hours}$$

$$= (€14.80 - €14 = \underline{€0.80}) * (8.1 * 1,050 = \underline{8,505})$$

$$= \underline{\underline{€6,804 \text{ Unfavourable}}}.$$

- **Labour efficiency variance (LEV)**

$$= (\text{Actual hours} - \text{Standard hours}) * \text{Standard wage rate}$$

$$= [8,505 - (8 * 1,050 = 8,400) = \underline{105}] * €14$$

$$= \underline{\underline{€1,470 \text{ Unfavourable}}}.$$

- **Hence: total = €6,804 (U) + €1,470 (U) = €8,274 (U).**

The main limitation of this basic variance analysis is that, in itself, it gives little insight into the underlying causes of the two cost overruns and therefore provides Ava Ltd. with

no real basis for corrective action. For example, the LWRV might have been caused by market forces driving up wage rates across the entire labour market (an “uncontrollable” factor) and / or by a deliberate decision by a production manager in Ava Ltd. to switch to a more highly skilled and more expensive grade of labour in the hope of achieving efficiency improvements in the long term. Also, the LEV might have been caused by disappointing levels of productivity when staff were working and/or by “idle time”, i.e., staff having to be paid for certain hours when they were not working at all (e.g., because of a rostering error). More detailed variance analysis (see below) may reveal the extent of cost overruns caused by any of these problems individually.

Another (although less important) consideration with variance analysis is that, even at the “basic” level, it would be disingenuous to claim that the formulas give results which are “correct down to the last €”. For example, looking at the formula for LEV, we might reasonably ask why we don’t multiply by **actual** rather than **standard** wage rate. The answer is that a small part of the **LWRV** (as defined by the formula above) is due to a combination of efficiency and wage rate cost overruns. If we want the sum of the variances to reconcile the differences between the budget and actual results, then it’s important that this “combined” element should be included only once in the variance calculations. The formulas above achieve that end. So it is simply a matter of consistency and “making the reconciliation balance”, even though it could reasonably be argued that the actual wage rate provides at least as good a measure of the hourly cost of the additional hours.

## **Stage 2: Quantifying the effects of labour idle time**

Assume now that 30 of the actual paid labour hours were “idle”, arising from a rostering error of the type mentioned earlier. We can now partition the labour efficiency variance into two parts, i.e.:

- Labour idle time variance, which quantifies the cost of paying for those 30 idle hours.
- A “pure” labour efficiency variance, which compares active worked hours with standard hours.

Both of these variances are measured using the standard (rather than actual) wage rate. The reason for this is that they are subparts of the “overall” labour efficiency variance as calculated earlier, which also uses the standard wage rate. The variances are as follows:

- **Labour idle time variance (LITV)**

= Idle labour hours paid for \* Standard wage rate per hour

= 30 hours \* €14

= **€420 Unfavourable.**

- **Pure labour efficiency variance (PLEV)**

= (Actual “active worked hours” – Standard hours) \* Standard wage rate

= [(8,505 – 30 = 8,475) – 8,400 = 75] \* €14

= **€1,050 Unfavourable.**

This additional level of detail provides insight into the extent to which the cost of “extra” labour hours comes from rostering issues and/or staff productivity. This is important

because these issues are likely to be controllable by different individuals or functions in the organisation (e.g., one person may be in charge of rostering and a different person in charge of staff motivation and efficiency).

We can summarise the Stage 2 variances as follows:

LITV	PLEV	<b>Total LEV = LITV + PLEV</b>	LWRV (same as Stage 1)	<b>Total (same as Stage 1)</b>
€420 U	€1,050 U	<b>€1,470 U</b>	€6,804 U	<b>€8,274 U</b>

### **Stage 3: Planning and operational variances for labour**

In principle, virtually any variance can be broken down into two parts. These are a “planning part” (which arises from errors in the original budgetary standards) and an “operational part” (which arises from differences between actual outcomes and “realistically achievable” standards). These “realistically achievable” standards are the ones which arguably should have been used in the budget (because they represented the best information available when the budget was being assembled) but in practice were not because of failings in the budgetary process.

For example, suppose that in this case Ava Ltd. had agreed to a 10% increase in the hourly wage rate, to take effect from the beginning of the most recent production period. Also, assume that an engineering analysis revealed that (given high staff turnover among experienced employees) a realistic expectation of productivity would be 8.4 DLH per unit of output. As shown above, the budget was based on different (and essentially out-of-date) standards.

It would be quite difficult to memorise a full list of formulas for all possible planning and operational variances, or even to develop a comprehensive “cheat sheet” or list of formulas. Fortunately it is quite easy to derive any formula as needed. Let’s start with the following sketch:

# ← Basic variances →

Original *ex ante* standard  
(XAS)

Revised *ex post* standard  
(XPS)

Actual  
outcome

← Planning variances →

← Operational variances →

First, let's consider **planning** variances. From the above diagram, it's clear that (like basic variances) planning variances "begin with" the original budgetary standards (XAS). It's also clear that (in contrast to basic variances) planning variances "end with" the revised budgetary standards (XPS) rather than actual results. So we derive the formulas for planning variances by first writing down the formula for the corresponding basic variances and editing accordingly. Hence:

## Labour wage rate variance (LWRV):

- "Basic" LWRV = (Actual wage rate – Standard wage rate) \* Actual hours
- Hence: "Planning" LWRV  

$$= (\text{XPS wage rate} - \text{XAS wage rate}) * \text{XPS hours}$$

$$= [(\text{€}14 \text{ plus } 10\% = \text{€}15.40) - \text{€}14] * [1,050 \text{ units} * 8.4 \text{ DLH} = 8,820 \text{ LH}]$$

$$= \text{€}12,348 \text{ Unfavourable.}$$

## Labour efficiency variance (LEV):

- "Basic" LEV = (Actual hours – Standard hours) \* Standard wage rate
- Hence: "Planning" LEV = (XPS hours – XAS hours) \* XAS wage rate  

$$= (8,820 - 8,400) * \text{€}14$$

$$= \text{€}5,880 \text{ Unfavourable.}$$

Now let's turn to the **operational** variances. From the diagram earlier, we can see that (like basic variances) operational variances "end with" the actual results. Equally, it's also clear that (in contrast to basic variances) operational variances "begin with" the revised budgetary standards (XPS) rather than the original budgetary standards (XAS).

So we derive the formulas for operational variances by first writing down the formulas for the corresponding basic variances and editing accordingly. Hence:

**Labour wage rate variance (LWRV):**

- "Basic" LWRV = (Actual wage rate – Standard wage rate) \* Actual hours
- Hence: "Operational" LWRV  
= (Actual wage rate – XPS wage rate) \* Actual hours  
= (€14.80 - €15.40) \* 8,505 LH  
= **€5,103 Favourable.**

**Labour efficiency variance (LEV):**

- "Basic" LEV = (Actual hours – Standard hours) \* Standard wage rate
- Hence: "Operational" LEV = (Actual hours – XPS hours) \* XPS wage rate  
= (8,505 – 8,820) \* €15.40  
= **€4,851 Favourable.**

The results of the planning and operational variance analysis are arithmetically consistent with the results of the less detailed analysis conducted in Stages 1 and 2:

← Planning variances →		← Operational variances →		Total variance
LWRV	LEV	LWRV	LEV	
€12,348 Unfavourable	€5,880 Unfavourable	€5,103 Favourable	€4,851 Favourable	<b>€8,274 Unfavourable</b>

So, what is the point of conducting the more detailed analysis if the overall result is the same? The answer to this question is that the breakdown provides insights which are not available from the more basic variances. The unfavourable planning variances indicate that costs were underestimated at the time when the budget was being put together, reflecting a failure to use information about cost increases which was available at that time. By contrast the favourable operational variances capture the overall financial benefit arising from the fact that, in the course of the month, the company's management achieved cost levels which were better than those believed to be attainable when the budget was being assembled (specifically, better productivity and a lower hourly wage rate).

What about the labour idle time variance (LITV) in this case? We can find this by examining the **operational** labour efficiency variance (LEV) and dividing it into two parts, viz., a LITV and a "pure" operational LEV. Notice that the wage rate used in calculating the operational LEV is the XPS wage rate (see above) and therefore this is the wage rate which must be used in calculating these two elements:

- **Labour idle time variance (LITV)**

= Idle labour hours paid for \* XPS wage rate per hour

= 30 hours \* €15.40

= **€462 Unfavourable.**

- **Pure labour efficiency variance (PLEV)**

= (Actual "active worked hours" – XPS hours) \* XPS wage rate

= (8,475 – 8,820) \* €15.40

= **€5,313 Favourable.**

Notice that we have slightly different measures of the unfavourable LITV (€420 or €462) depending on whether we look at the "Stage 2" or "Stage 3" results). We might have expected a more definitive answer since the LITV measures something quite specific, i.e., the cost of paying for DLH during which no work was done. There is no doubt as to the number of idle hours (30) but where the formulas diverge is in whether to multiply by the original or revised standard wage rate (XAS or XPS). This is essentially a technical difference, arising from the fact that planning & operational variance analysis deals with the combined price/efficiency variance slightly differently to how basic variance analysis treats the same combined variance.