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THE STATA JOURNAL

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Stata tip 101: Previous but different

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Given a time series that changes intermittently, there may be interest in identifying the most recent value that differed from the present value. Given a history that was 36, 36, 36, 42 before a present value of 42, the value that was most recent but different is 36. That is easy enough to determine by eye, but how could we calculate that systematically in Stata? Such distinct values define runs or spells, as discussed in detail in [Cox \(2007\)](#), but here we examine the problem directly.

Adding some more detail, let us suppose first that we have a single panel with data starting with

```
time: 2, 3, 5, 7, 11  
value: 36, 36, 36, 42, 42
```

The example is of irregularly spaced times, and in fact only one time step is 1 in whatever units we are using. These data were devised to emphasize that the method to be explained does not depend on anything other than the time variable being known and single-valued for a given panel and values being in **sort** order of time. We can always ensure that last condition by **sorting** on the time variable. Not only do we not need to **tsset**, but that machinery and the related apparatus of time-series operators (such as **L.** and **D.**) would not help much, even for regularly spaced data.

Information on previous values comes from when the value changes. We can create a new variable containing previous values using subscripts:

```
. generate previous = value[_n-1] if value != value[_n-1]
```

Because **_n** means the present observation number, **_n - 1** means the previous observation number. If this is new to you, get more information by typing **help subscripting** into Stata.

The new variable in our example now includes missings in all but one observation: **., ., ., 36, .** are its values. The value of 36 clearly comes from the one point at which **value** changes, but we also need to understand the logic for the other observations.

Let us focus first on **value[1]**. Its previous value is **value[0]**, a hypothetical value beyond the dataset. Stata does not know what that is but does not regard a request to access **value[0]** as illegal; it merely returns missing. Now we have **value[1]** of 36, which differs from **value[0]** of missing, so **previous[1]** is returned as **value[0]**, namely, missing.

The reasoning for **value[2]**, **value[3]**, and **value[5]** is different. In each case, **value** is equal to the previous **value**, but the **generate** statement included no instruc-

tions for what to do if the inequality was not satisfied. So missing is also returned, the same result for a different reason.

We must now fill in missing values to the best of our ability. In particular, 36 is the previous but different value for observation 5 as well as observation 4. Exploiting the fact that `generate` and `replace` use the current sort order (Newson 2004), we can fill in missing values in a cascade:

```
. replace previous = previous[_n-1] if missing(previous)
```

That still leaves a block of missings before the first value change. Furthermore, if `value` never changed within our data, there would be no previous but different value to identify.

```
. list
```

	time	value	previous
1.	2	36	.
2.	3	36	.
3.	5	36	.
4.	7	42	36
5.	11	42	36

Now we need to extend this to any number of panels. Given also an identifier, the extension is just to do all using `by`: (Cox 2002):

```
. by id (time), sort: generate previous = value[_n-1] if value != value[_n-1]
. by id: replace previous = previous[_n-1] if missing(previous)
```

If there are missings in `value`, they would be better filled in first in a clone of `value` using the cascade device. The difference from the previous different value is then simply (regardless of panel context or time spacing)

```
. generate diff = value - previous
```

If we wanted to look forward in time to identify the next value that is different, it is easiest to reverse time temporarily:

```
. gsort id -time
. by id: generate next = value[_n-1] if value != value[_n-1]
. by id: replace next = next[_n-1] if missing(next)
. sort id time
```

References

- Cox, N. J. 2002. Speaking Stata: How to move step by: step. *Stata Journal* 2: 86–102.
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