Plotting time-series data with seaborn

Say I create a fully random `Dataframe` using the following:

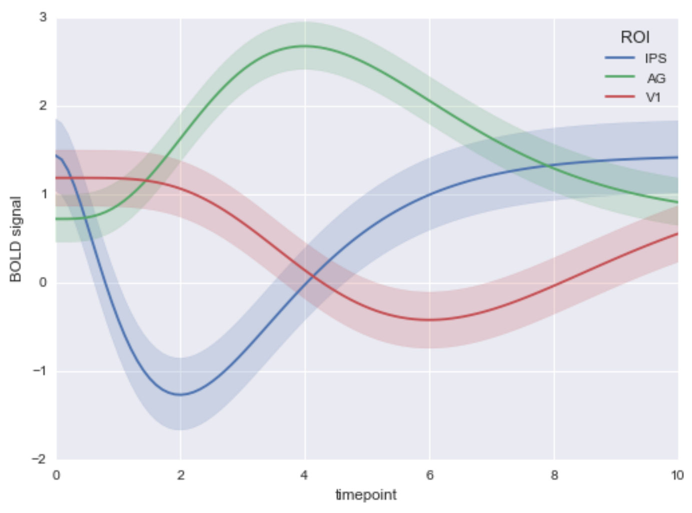
```
from pandas.util import testing
from random import randrange

def random_date(start, end):
    delta = end - start
    int_delta = (delta.days * 24 * 60 * 60) + delta.seconds
    random_second = randrange(int_delta)
    return start + timedelta(seconds=random_second)

def rand_dataframe():
  df = testing.makeDataFrame()
  df['date'] = [random_date(datetime.date(2014,3,18),datetime.date(2014,4,1)) for x in
xrange(df.shape[0])]
  df.sort(columns=['date'], inplace=True)
  return df

df = rand_dataframe()
```

which results in the dataframe shown at the bottom of this post. I would like to plot my columns `A` , `B` , `C` and `D` using the timeseries visualization features in `seaborn` so that I get something along these lines:



How can I approach this problem? From what I read on this notebook, the call should be:

```
sns.tsplot(df, time="time", unit="unit", condition="condition", value="value")
```

but this seems to require that the dataframe is represented in a different way, with the columns somehow encoding `time` , `unit` , `condition` and `value` , which is not my case. How can I convert my dataframe (shown below) into this format?

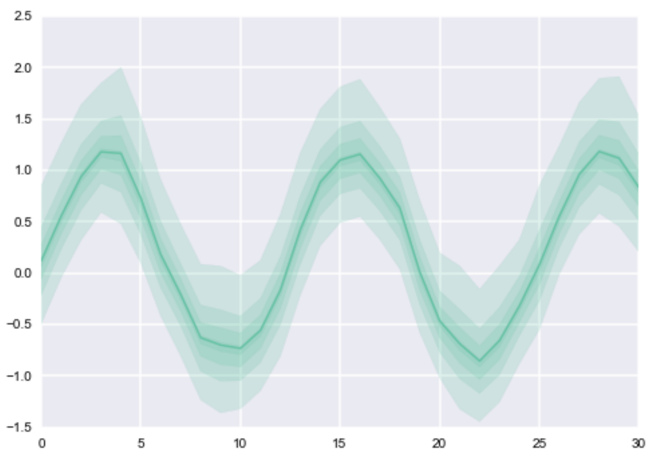
Here is my dataframe:

```
      date         A         B         C         D

2014-03-18  1.223777  0.356887  1.201624  1.968612
2014-03-18  0.160730  1.888415  0.306334  0.203939
2014-03-18 -0.203101 -0.161298  2.426540  0.056791
2014-03-18 -1.350102  0.990093  0.495406  0.036215
2014-03-18 -1.862960  2.673009 -0.545336 -0.925385
2014-03-19  0.238281  0.468102 -0.150869  0.955069
2014-03-20  1.575317  0.811892  0.198165  1.117805
2014-03-20  0.822698 -0.398840 -1.277511  0.811691
```

```
2014-03-20  2.143201 -0.827853 -0.989221  1.088297
2014-03-20  0.299331  1.144311 -0.387854  0.209612
2014-03-20  1.284111 -0.470287 -0.172949 -0.792020
2014-03-22  1.031994  1.059394  0.037627  0.101246
2014-03-22  0.889149  0.724618  0.459405  1.023127
2014-03-23 -1.136320 -0.396265 -1.833737  1.478656
2014-03-23 -0.740400 -0.644395 -1.221330  0.321805
2014-03-23 -0.443021 -0.172013  0.020392 -2.368532
2014-03-23  1.063545  0.039607  1.673722  1.707222
2014-03-24  0.865192 -0.036810 -1.162648  0.947431
2014-03-24 -1.671451  0.979238 -0.701093 -1.204192
2014-03-26 -1.903534 -1.550349  0.267547 -0.585541
2014-03-27  2.515671 -0.271228 -1.993744 -0.671797
2014-03-27  1.728133 -0.423410 -0.620908  1.430503
2014-03-28 -1.446037 -0.229452 -0.996486  0.120554
2014-03-28 -0.664443 -0.665207  0.512771  0.066071
2014-03-29 -1.093379 -0.936449 -0.930999  0.389743
2014-03-29  1.205712 -0.356070 -0.595944  0.702238
2014-03-29 -1.069506  0.358093  1.217409 -2.286798
2014-03-29  2.441311  1.391739 -0.838139  0.226026
2014-03-31  1.471447 -0.987615  0.201999  1.228070
2014-03-31 -0.050524  0.539846  0.133359 -0.833252
```

In the end, what I am looking for is an overlay of of plots (one per column), where each of them looks as follows (note that different values of CI get different values of alphas):



python matplotlib pandas seaborn

edited Apr 2 '14 at 0:14

asked Apr 1 '14 at 19:38
Amelio Vazquez-Reina
14.1k 22 116 271

you've got duplicate dates in your index. intentional? if so, what's the significance of that? – Paul H Apr 1 '14 at 20:13

Thanks @PaulH It is intentional, although they could be moved to a column. I have multiple samples per date and I would like to capture that variability per date in the thickness of the band in the plot. – Amelio Vazquez-Reina Apr 1 '14 at 20:18

so to be verbose, the line itself comes from the mean value for a given date and the shaded band is bounded by the min and max? – Paul H Apr 1 '14 at 20:34

also, can you add your import statements? where does `randrange` come from? – Paul H Apr 1 '14 at 20:38

@PaulH I fixed the imports. Ideally the band should capture confidence intervals at `Q1` and `Q3` , as in en.wikipedia.org/wiki/File:Boxplot_vs_PDF.svg – Amelio Vazquez-Reina Apr 1 '14 at 20:39

1 Answer

I don't think `tsplot` is going to work with the data you have. The assumptions it makes about the input data are that you've sampled the same units at each timepoint (although you can have missing timepoints for some units).

For example, say you measured blood pressure from the same people every day for a month, and then you wanted to plot the average blood pressure by condition (where maybe the "condition" variable is the diet they are on). `tsplot` could do this, with a call that would look something like `sns.tsplot(df, time="day", unit="person", condition="diet", value="blood_pressure")`

That scenario is different from having large groups of people on different diets and each day randomly sampling some from each group and measuring their blood pressure. From the example you gave, it seems like your data are structured like the this.

However, it's not that hard to come up with a mix of matplotlib and pandas that will do what I think you want:

```
# Read in the data from the stackoverflow question
df = pd.read_clipboard().iloc[1:]
```

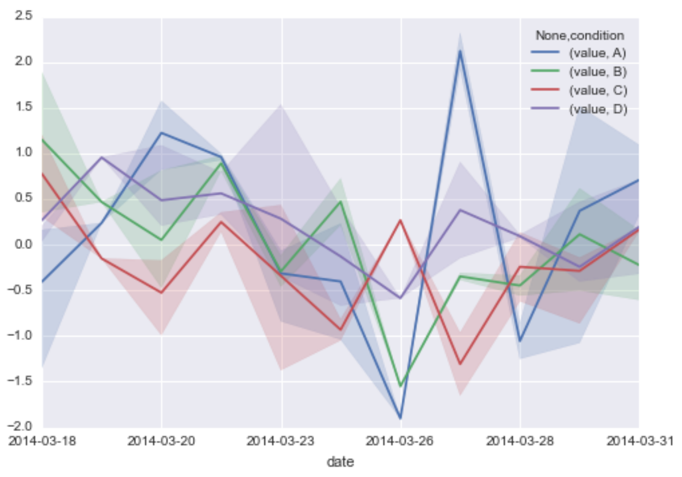
```
# Convert it to "long-form" or "tidy" representation
df = pd.melt(df, id_vars=["date"], var_name="condition")

# Plot the average value by condition and date
ax = df.groupby(["condition", "date"]).mean().unstack("condition").plot()

# Get a reference to the x-points corresponding to the dates and the the colors
x = np.arange(len(df.date.unique()))
palette = sns.color_palette()

# Calculate the 25th and 75th percentiles of the data
# and plot a translucent band between them
for cond, cond_df in df.groupby("condition"):
    low = cond_df.groupby("date").value.apply(np.percentile, 25)
    high = cond_df.groupby("date").value.apply(np.percentile, 75)
    ax.fill_between(x, low, high, alpha=.2, color=palette.pop(0))
```

This code produces:



edited Apr 1 '14 at 23:57 answered Apr 1 '14 at 23:35

mwaskom
8,122 2 19 33

Thanks. Why do you think `tsplot` won't work? I can understand that the statistical assumptions don't carry over, but how does `tsplot` know where the samples come from? Does it assume a constant number of elements per date? – Amelio Vazquez-Reina Apr 2 '14 at 0:11

1 That's what the `unit` parameter is for -- you're telling it which unit each sample corresponds to, and then there it expectes that each unit will be represented for each timepoint. – mwaskom Apr 2 '14 at 0:16

The reason why I ask is because I was particularly interested in the ability of `tsplot` of using a different alpha value for different values of the confidence interval (I updated the OP to highlight this at the end) – Amelio Vazquez-Reina Apr 2 '14 at 0:16

3 You could add an inner loop and repeat the `fill_between` block for different intervals `tsplot` is just drawing multiple patches on top of each other, not anything fancy with the alpha itself. – mwaskom Apr 2 '14 at 0:29

is that possible to avoid data conversion to 'long-form' (which is not efficient)?? – edouard Feb 16 at 21:46