# Discussion of the paper by Caporin, Pelizzon,Ravazzolo, Rigobon

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# Contagion

- Contagion? Nice word!
- Statistical meaning?

1. “co-movement that takes place under extreme conditions (or tail events)”
2. “how shocks propagate differently during normal and rare events”

# Contagion

- Symmetric definition?
- Conditional definition?
- The paper asserts that: “it is impossible to solve this definitional problem in this paper”
- However: “Our objective is to present convincing evidence of the amount of contagion that takes place according to the second definition”

# Contagion

- “In other words, we are interested in understanding how much potential contagion exists within the European sovereign debt market, where contagion is defined as **how different the propagation is after a large negative realization has taken place compared to the propagation after an average realization**”
- Symmetric? Conditional?

# Contagion

- Then comes correlation:
- “In other words, if the correlation between two variables is different in normal and in crisis times, how can we be sure that this difference is due to the outcome of a shift in the propagation mechanism and not the result of the fact that correlations are not neutral to shifts in volatility?”
- But what is “a shift in the propagation mechanism?”

# interdependence and contagion

- Suppose R.V.s Y and X are linearly connected
- $Y=a+bX+u$
- Where a and b are constants and u is random with $E(u|X)=0$ so that $a+bX=E(Y|X)$
- Since $V(Y)=b^2V(X)+V(u)$
- $R^2 =b^2V(X)/V(Y)=b^2V(X)/(b^2V(X)+V(u))$
- May increase only in three ways:

# interdependence and contagion

- If b increases (how? As a R.V. cond on X? As f(t)?)
- If V(X) increases
- If V(u) decreases
- (or combinations of these effects)
- Forbes and Rigobon (2002) define
- “contagion” the first case (this should be the “shift in the propagation mechanism”)
- “interdependence” the second
- ?… the third

# interdependence and contagion

- SUPPOSE b and V(u) are constants
- Compute the ratio between two $R^2$ s ($R^2$ and $RR^2$ ) with different V(X) (V(X) and VV(X))
- (Could be the result of conditioning x to be in some A or, simply, a change in variance)
- $R^2 / RR^2 = R^2 + (1- R^2 )V(X)/VV(X)$
- So if VV(X)>V(X) <=> $RR^2 > R^2$
- In Forbes and Rigobon (2002) this fact is called a “bias” of the correlation coefficient

# interdependence and contagion

- Obviously this is NOT a bias in any statistical sense: the correlation IS different
- The implication of Forbes and Rigobon (2002) is Not that studies based on correlations are wrong, But that they fail to distinguish between changed or unchanged b (which is obvious since they deal with a symmetric index of dependence)
- In this sense what they do in the following graph is NOT a correction for a bias but the computation of correlations conditional to the fact that b, V(u) and V(X) are fixed at a given level
- Obviously you can choose ANY reference level for V(X)

# interdependence and contagion

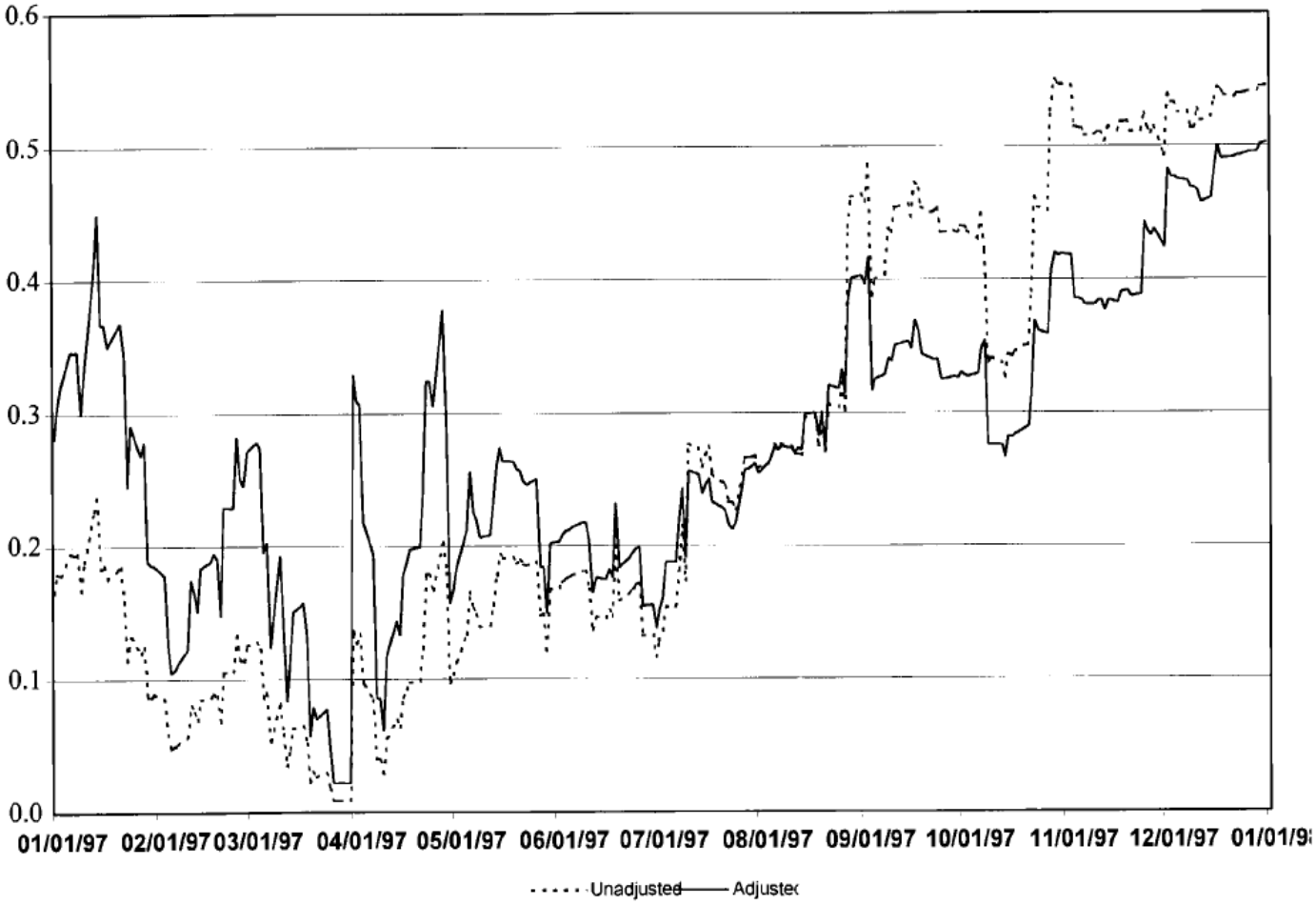



Figure 4: Cross-Market Correlations: Hong Kong and the Philippines.

# interdependence and contagion

- Best thing would be to do rolling betas not rolling correlations and test for constancy of beta (and absence of hsch) or using dummies for extreme values of X
- There is a wide scope for a criticism of an asymmetric definition of contagion/interdependence as the Forbes and Rigobon (2002) definition.
- Just a note: since $b_{YX}b_{XY}=R^2$ if $R^2$ “changes” one of the two regression coefficients MUST have changed
- Why compute “adjusted correlation” supposing it was “the other” coefficient to change?

# interdependence and contagion

- In any case, provided the specification of the model for y is correct, a test for this definition of contagion/interdependence is a test against or for:
- b constant
- V(u) constant
- V(X) increased

# interdependence and contagion

- This paper suggests the use of quantile regression
- Contagion is defined as non parallel conditional quantiles
- It is not fully clear the reason for this
- The missing link is a precise connection between the definition of contagion/interdependence and the quantiles of the distribution of Y|X

# interdependence and contagion

- Moreover:
- “Correlation measures cannot be used to investigate the sovereign risk spillover among countries. Yet, the adjustment proposed in Forbes and Rigobon (2002) cannot be used in this case. The primarily reason is that such an adjustment requires knowing the source of the increase in volatility”
- Provided that the first statement is incorrect, the second statement is due to the above quoted asymmetry of a definition based on a conditional model
- However quantile regression is STILL a conditional model

# interdependence and contagion

- The idea of the paper is the following
- “Since, we define contagion as a shift in the intensity of propagation when large shocks occur compared to normal times, we compare the coefficient of the propagation of shocks between two countries when the country of interest shows values that belong to the highest quantiles during turbulent times and the middle ones during normal times. When the coefficients are stable over quantiles we reject the contagion hypothesis”.

# interdependence and contagion

- It is clear that the underlying idea is that of some symmetric measure of cross quantile dependence but this is NOT what a quantile regression yields
- A quantile regression is NOT a regression between quantiles which (while still asymmetric) seems to be what the above definition asks for
- A quantile regression is an attempt of fitting a linear (in the parameters) function of X to the quantiles of the conditional distribution of Y given X

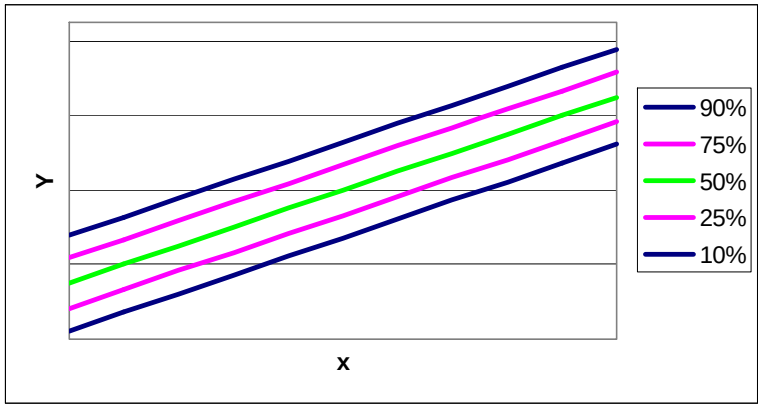
# interdependence and contagion

- The procedure is
- Estimate the conditional quantile functions and see if the dependence on X of extreme quantiles (of Y) is different than the dependence of other quantiles
- These quantile functions, however, are estimated on the full dataset not only for a subset of (extreme) values of X
- The implied hp is that the conditional distributions of Y given X are the same in “quiet” and “turbulent” times
- Quantile regression allows the quantiles (and not only the mean) of these distributions to be a function of X

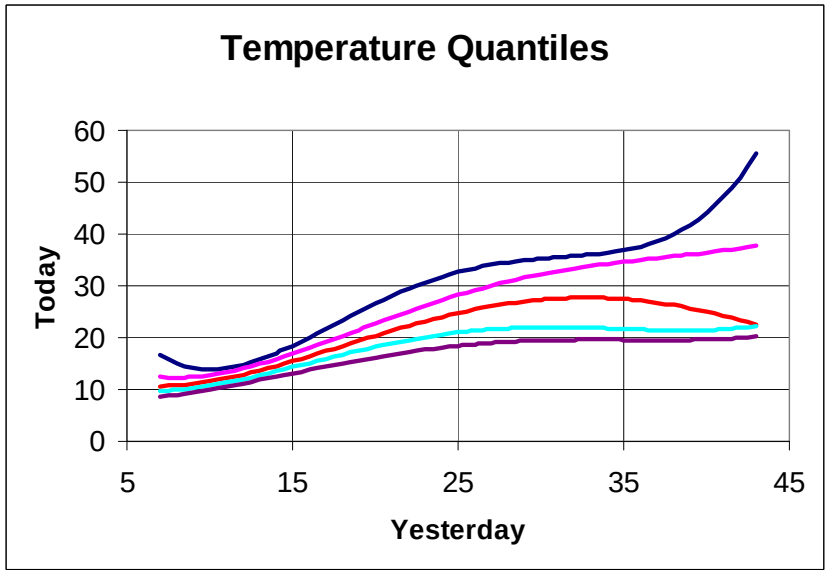
# interdependence and contagion

- Inplicit in the original definition is that the conditional distribution of Y|X (all of it for all Xs) changes because b changes under some condition (maybe depending on X being in some “extreme” set of values but this is quite messy as the definition DEPENDS on a specific unchanging hp on the regression function)
- Your definition is that there is no change in the distribution but a different response of different quantiles to changes in X at ANY level of values of X (ie: non parallel quantile functions, if you regress on X and not on f(X))
- For instance: we may have contagion if, say, the .90 quantile dependence on X is 1 while the .50 quantile dependence is .5 for any level of X
- The two definitions can be consistent only if we suppose that, in both, b and the b’s of quantile functions are functions of X.

# Quantile functions




Quantiles are functions of powers of X ----------→



# Quantile functions*

- Coefficients of quantile functions tell you how conditional quantiles change for a change of X…
- …IF you suppose that a change of X does not change the order (P) of the quantile
- This is different than regression coefficient interpretation
- To better understand keep in mind that a change of X moves ALL quantiles of the distribution at the same time
- An implication of this is that you cannot use conditional quantile functions to study how much of a change in X is required for moving Y from the e.g. .50 to the .90 quantile
- This is somewhat of a problem if we wish to use this to study dependence between extreme quantiles

# Quantile functions*

- Moreover, since quantiles cannot cross, they shall tend to be parallel just to avoid inconsistencies in estimation
- (Very dangerous the use of polynomials, see second plot above)

# Some sparse comments: Data

- Differences in levels of cds spreads and bond spreads
- Some doubt on the choice: return distributions seem much more stable and give different results
- Be careful if you use Datastream data (zeroes)

# Some sparse comments: Models

- Common level of spreads?
- In each model two spreads are connected…

# Some sparse comments: Correlations

- Rolling correlations.
- Are they really “different”?
- If the average is .55 the (2* sigma) interval .34 to . 70  covers the full dataset (and these are eight different countries)

# Some sparse comments: Correlations

Figure 3: CDS Average Rolling Correlation Among Countries


Notes: This figure depicts a 60-days rolling window average correlation among CDS spreads.

# Some sparse comments: Bayes model

- No time
- No comment

# Conclusions

- I found the paper very interesting
- I still have to understand the precise meaning and the relevance of the definition of contagion
- IF correlation does increases during turmoil the point is why
- (And why could it be relevant to ask why)
- Quantile modelling may be useful but a proper definition of contagion in this setting should be made precise

# Conclusions: from criticisms to crises

- Κρίσις (from κρίνω to choose) Resolution of unity, judgement, decision, turning point, the midpoint of the spinal column
- 危机 *wēijī Dangerous+crucial point*
- *Some (e.g. Kennedy, Nixon, Al Gore, Condoleeza Rice and, most important and clever of all, Lisa Simpson) believe that* 机 (*jī ) means "opportunity"*
- *There is a story about this probably wrong idea, however, opportunity is from ob+portus: passage+way*
- *So: crisis=dangerous passageway … in ANY case, we are back to:*

# DIRE STRAITS