Evolution of the *Quant* from the Glory Days to the New Normal

J. Michael Steele
University of Pennsylvania, Wharton School

Ripped from the Headlines ...

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.
  - Check out that date: virtually the *Bottom* of the bear market

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.
  - Check out that date: virtually the *Bottom* of the bear market
  - On March 9, 2009 the SP500 hit the Devilish level of 666 — then doubled in 24 months.

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.
  - Check out that date: virtually the *Bottom* of the bear market
  - On March 9, 2009 the SP500 hit the Devilish level of 666 — then doubled in 24 months.
- "Slices of Risk: How a Formula Ignited Market That Burned Some Big Investors" — Mark Whitehouse *Wall Street Journal* September 12, 2005

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.
  - Check out that date: virtually the *Bottom* of the bear market
  - On March 9, 2009 the SP500 hit the Devilish level of 666 — then doubled in 24 months.
- "Slices of Risk: How a Formula Ignited Market That Burned Some Big Investors" — Mark Whitehouse *Wall Street Journal* September 12, 2005
  - Does this date look right — way back in 2005?

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.
  - Check out that date: virtually the *Bottom* of the bear market
  - On March 9, 2009 the SP500 hit the Devilish level of 666 — then doubled in 24 months.
- "Slices of Risk: How a Formula Ignited Market That Burned Some Big Investors" — Mark Whitehouse *Wall Street Journal* September 12, 2005
  - Does this date look right — way back in 2005?
  - Yet this was the real story ... and when the Quant Egg First Started to Crack.

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.
  - Check out that date: virtually the *Bottom* of the bear market
  - On March 9, 2009 the SP500 hit the Devilish level of 666 — then doubled in 24 months.
- "Slices of Risk: How a Formula Ignited Market That Burned Some Big Investors" — Mark Whitehouse *Wall Street Journal* September 12, 2005
  - Does this date look right — way back in 2005?
  - Yet this was the real story ... and when the Quant Egg First Started to Crack.
- A Soup for Several Themes:

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.
  - Check out that date: virtually the *Bottom* of the bear market
  - On March 9, 2009 the SP500 hit the Devilish level of 666 — then doubled in 24 months.
- "Slices of Risk: How a Formula Ignited Market That Burned Some Big Investors" — Mark Whitehouse *Wall Street Journal* September 12, 2005
  - Does this date look right — way back in 2005?
  - Yet this was the real story ... and when the Quant Egg First Started to Crack.
- A Soup for Several Themes:
  - The Demand and Supply of Models

Ripped from the Headlines ...

- "Recipe for Disaster: The Formula That Killed Wall Street" — Felix Salmon *Wired Magazine* February 23, 2009.
  - Check out that date: virtually the *Bottom* of the bear market
  - On March 9, 2009 the SP500 hit the Devilish level of 666 — then doubled in 24 months.
- "Slices of Risk: How a Formula Ignited Market That Burned Some Big Investors" — Mark Whitehouse *Wall Street Journal* September 12, 2005
  - Does this date look right — way back in 2005?
  - Yet this was the real story ... and when the Quant Egg First Started to Crack.
- A Soup for Several Themes:
  - The Demand and Supply of Models
  - Twain's Rhyme: Financial History and Possible Futures

The Beginning of Any Model – an "Object of Interest"

The Beginning of Any Model – an "Object of Interest"

- What is a CDO and Why do we Care?

The Beginning of Any Model – an "Object of Interest"

- What is a CDO and Why do we Care?
  - CDO is a TLA for ...

The Beginning of Any Model – an “Object of Interest”

- What is a CDO and Why do we Care?
  - CDO is a TLA for ...
  - *Collateralized Debt Obligation*: Which is almost the original work of “financial engineering” where one builds a new financial product out of available financial raw material.

The Beginning of Any Model – an "Object of Interest"

- What is a CDO and Why do we Care?
  - CDO is a TLA for ...
  - *Collateralized Debt Obligation*: Which is almost the original work of "financial engineering" where one builds a new financial product out of available financial raw material.
  - The classic raw material for building a CDO is a collection of residential mortgages but any collection of "debt instruments" will do (even other CDOs).

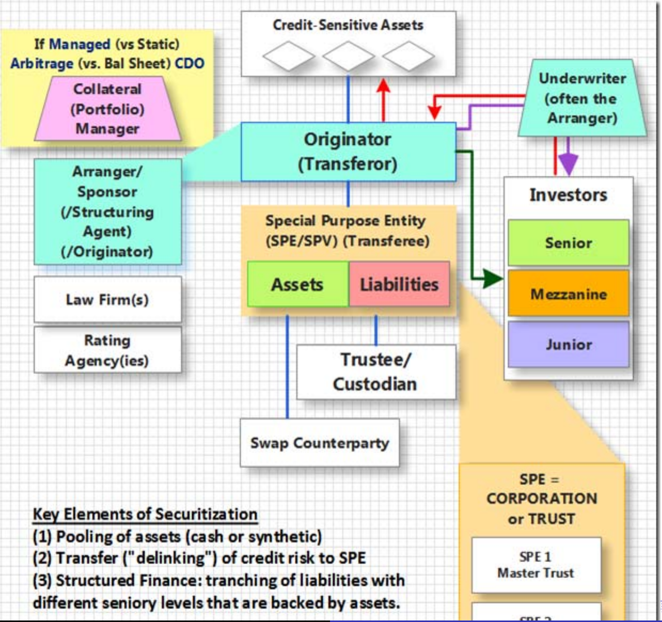
The Beginning of Any Model – an "Object of Interest"

- What is a CDO and Why do we Care?
  - CDO is a TLA for ...
  - *Collateralized Debt Obligation*: Which is almost the original work of "financial engineering" where one builds a new financial product out of available financial raw material.
  - The classic raw material for building a CDO is a collection of residential mortgages but any collection of "debt instruments" will do (even other CDOs).
  - CDOs were first engineered in 1987, but their volume ROARED up during US Residential housing boom of the 2000's. At the peak in 2006 issuance was 520 Billion USD.

The Beginning of Any Model – an "Object of Interest"

- What is a CDO and Why do we Care?
  - CDO is a TLA for ...
  - *Collateralized Debt Obligation*: Which is almost the original work of "financial engineering" where one builds a new financial product out of available financial raw material.
  - The classic raw material for building a CDO is a collection of residential mortgages but any collection of "debt instruments" will do (even other CDOs).
  - CDOs were first engineered in 1987, but their volume ROARED up during US Residential housing boom of the 2000's. At the peak in 2006 issuance was 520 Billion USD.
- Let's Look at a Picture of the Construction of a CDO

CDOs in a Picture



Why Everyone Loved CDOs

Why Everyone Loved CDOs

- Investors: They got a higher interest rate for a "comparable level of risk"

Why Everyone Loved CDOs

- Investors: They got a higher interest rate for a "comparable level of risk"
- Rating Agencies: For the years 2000-2006 they got 40% of their revenue from rating CDOs

Why Everyone Loved CDOs

- Investors: They got a higher interest rate for a "comparable level of risk"
- Rating Agencies: For the years 2000-2006 they got 40% of their revenue from rating CDOs
- Mortgage Originators: The could do more business without using up their balance sheet or taking credit risk.

Why Everyone Loved CDOs

- Investors: They got a higher interest rate for a "comparable level of risk"
- Rating Agencies: For the years 2000-2006 they got 40% of their revenue from rating CDOs
- Mortgage Originators: The could do more business without using up their balance sheet or taking credit risk.
- Home Purchasers: Many more people could buy homes — including some that should not have done so

Why Everyone Loved CDOs

- Investors: They got a higher interest rate for a "comparable level of risk"
- Rating Agencies: For the years 2000-2006 they got 40% of their revenue from rating CDOs
- Mortgage Originators: The could do more business without using up their balance sheet or taking credit risk.
- Home Purchasers: Many more people could buy homes — including some that should not have done so
- The Government: CDOs created placement for mortgage assets beyond Fannie Mae and Freddie Mac. Politicians could even imagine a day when Fannie Mae and Freddie Mac could be decommissioned.

What is Special about Risk in a Pool of Mortgages?

What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story

What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story
  - Independence and Normal Actuarial Risks

What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story
  - Independence and Normal Actuarial Risks
  - Actuarial science and mortality of a surviving spouse

What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story
  - Independence and Normal Actuarial Risks
  - Actuarial science and mortality of a surviving spouse
  - The great Mississippi Flood of 1927

What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story
  - Independence and Normal Actuarial Risks
  - Actuarial science and mortality of a surviving spouse
  - The great Mississippi Flood of 1927
  - The Mortgage Analogy: It's clear we need to consider the "dependence" of events.

What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story
  - Independence and Normal Actuarial Risks
  - Actuarial science and mortality of a surviving spouse
  - The great Mississippi Flood of 1927
  - The Mortgage Analogy: It's clear we need to consider the "dependence" of events.
- So How Does one Measure (or Model) the Dependence of Chance Driven Events?

What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story
  - Independence and Normal Actuarial Risks
  - Actuarial science and mortality of a surviving spouse
  - The great Mississippi Flood of 1927
  - The Mortgage Analogy: It's clear we need to consider the "dependence" of events.
- So How Does one Measure (or Model) the Dependence of Chance Driven Events?
  - First things first: P(A)

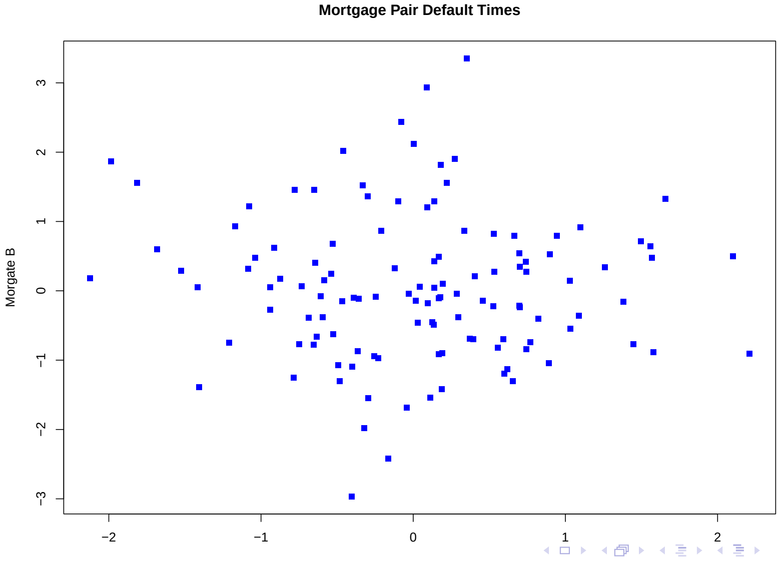
What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story
  - Independence and Normal Actuarial Risks
  - Actuarial science and mortality of a surviving spouse
  - The great Mississippi Flood of 1927
  - The Mortgage Analogy: It's clear we need to consider the "dependence" of events.
- So How Does one Measure (or Model) the Dependence of Chance Driven Events?
  - First things first: P(A)
  - Now, the harder P(B given A)

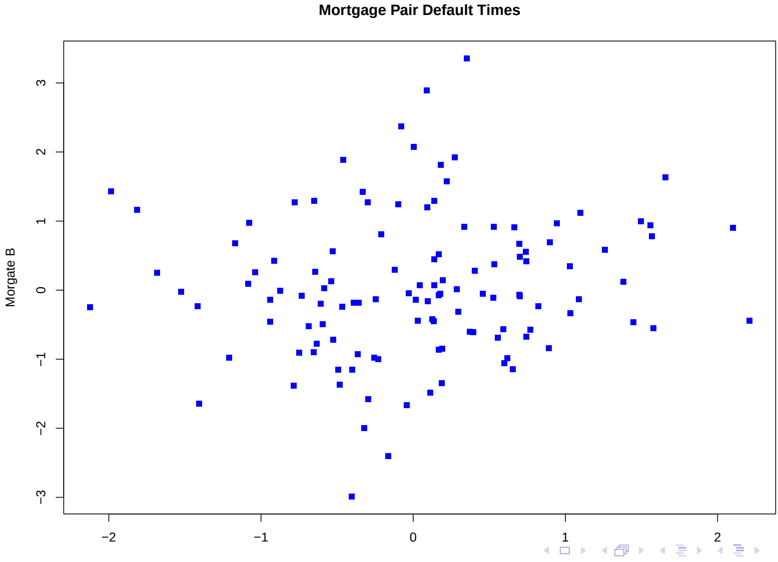
What is Special about Risk in a Pool of Mortgages?

- Insurance, Broken Hearts and a Farmer's Story
  - Independence and Normal Actuarial Risks
  - Actuarial science and mortality of a surviving spouse
  - The great Mississippi Flood of 1927
  - The Mortgage Analogy: It's clear we need to consider the "dependence" of events.
- So How Does one Measure (or Model) the Dependence of Chance Driven Events?
  - First things first: P(A)
  - Now, the harder P(B given A)
  - Always in Demand: Relevant Tools and Relevant Data

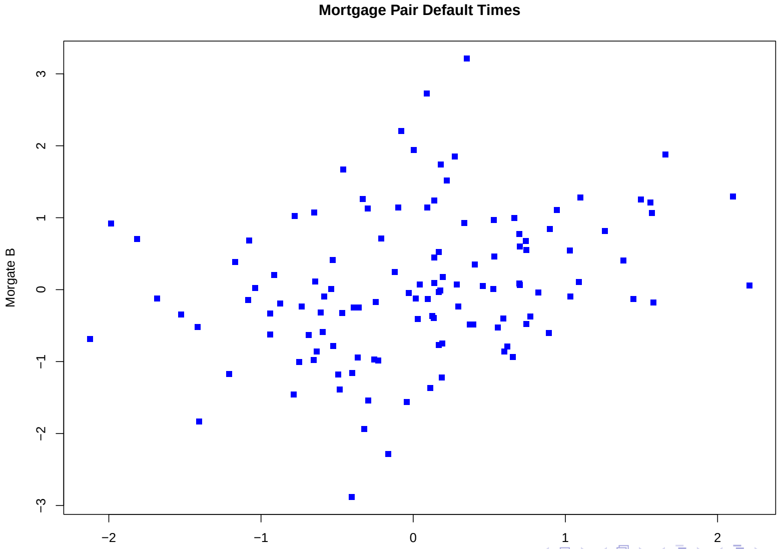
Default “Life Times” with Correlation Zero



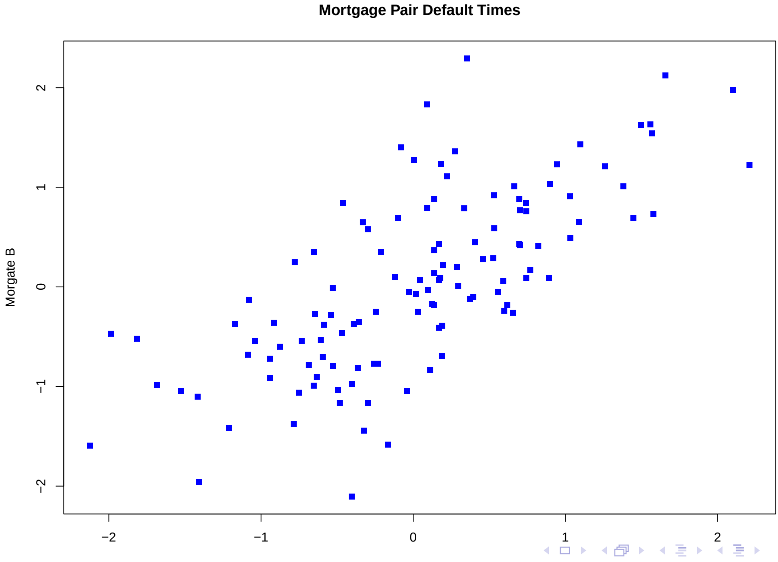
Default “Life Times” with 20% Correlation



Default "Life Times" with 40% Correlation



Default “Life Times” with 80% Correlation



Mottos for Modelers and David Li's Approach

Mottos for Modelers and David Li's Approach

- "All models are wrong, but some are useful." — G.E.P. Box

Mottos for Modelers and David Li's Approach

- "All models are wrong, but some are useful." — G.E.P. Box
- "A limited model is better than no model at all" — Anonymous

Mottos for Modelers and David Li's Approach

- "All models are wrong, but some are useful." — G.E.P. Box
- "A limited model is better than no model at all" — Anonymous
- "A model should be as simple as possible — but not simpler." — A. Einstein

Mottos for Modelers and David Li's Approach

- "All models are wrong, but some are useful." — G.E.P. Box
- "A limited model is better than no model at all" — Anonymous
- "A model should be as simple as possible — but not simpler." — A. Einstein
- David Li's Approach

Mottos for Modelers and David Li's Approach

- "All models are wrong, but some are useful." — G.E.P. Box
- "A limited model is better than no model at all" — Anonymous
- "A model should be as simple as possible — but not simpler." — A. Einstein
- David Li's Approach
  - Life Times are not normal (or Gaussian); but we can "transform them" to be normal.

Mottos for Modelers and David Li's Approach

- "All models are wrong, but some are useful." — G.E.P. Box
- "A limited model is better than no model at all" — Anonymous
- "A model should be as simple as possible — but not simpler." — A. Einstein
- David Li's Approach
  - Life Times are not normal (or Gaussian); but we can "transform them" to be normal.
  - With jointly normal data, we have the tool of correlation to "deal with" dependence.

Mottos for Modelers and David Li's Approach

- "All models are wrong, but some are useful." — G.E.P. Box
- "A limited model is better than no model at all" — Anonymous
- "A model should be as simple as possible — but not simpler." — A. Einstein
- David Li's Approach
  - Life Times are not normal (or Gaussian); but we can "transform them" to be normal.
  - With jointly normal data, we have the tool of correlation to "deal with" dependence.
  - True, we have zillions of correlations to worry about, but we "simplify the model" by assuming that all of the correlations are equal. After all, this is still progress, right?

Try a Little Mathematics (or, Day Dream for One Overhead)

Try a Little Mathematics (or, Day Dream for One Overhead)

- All This Transforming: Boiled Down

Try a Little Mathematics (or, Day Dream for One Overhead)

- All This Transforming: Boiled Down
  - A *copula* is a distribution function $C : [0,1]^d \rightarrow [0,1]$ with uniform marginals.

Try a Little Mathematics (or, Day Dream for One Overhead)

- All This Transforming: Boiled Down
  - A *copula* is a distribution function $C : [0,1]^d \to [0,1]$ with uniform marginals.
  - The "independence" copula (for d=2) is simply $C_{Ind}(x,y) = xy$.

Try a Little Mathematics (or, Day Dream for One Overhead)

- All This Transforming: Boiled Down
  - A *copula* is a distribution function $C : [0,1]^d \to [0,1]$ with uniform marginals.
  - The "independence" copula (for d=2) is simply $C_{Ind}(x,y) = xy$.
- The "Gaussian copula" is the modestly more scary:

$$C_{Gaus}(x,y) = \int_{\infty}^{\Phi^{-1}(x)} \int_{\infty}^{\Phi^{-1}(y)} \frac{1}{2\pi(1-\rho^2)^{1/2}} \exp\left\{ \frac{-s^2 - 2\rho st + t^2}{2(1-\rho^2)} \right\} ds$$

Try a Little Mathematics (or, Day Dream for One Overhead)

- All This Transforming: Boiled Down
  - A *copula* is a distribution function $C : [0,1]^d \to [0,1]$ with uniform marginals.
  - The "independence" copula (for d=2) is simply $C_{Ind}(x,y) = xy$.
- The "Gaussian copula" is the modestly more scary:

$$C_{Gaus}(x,y) = \int_{\infty}^{\Phi^{-1}(x)} \int_{\infty}^{\Phi^{-1}(y)} \frac{1}{2\pi(1-\rho^2)^{1/2}} \exp\left\{ \frac{-s^2 - 2\rho st + t^2}{2(1-\rho^2)} \right\} ds$$

- The famous Li Model is just

$$C_{Gaus}(F_A(x), F_B(y))$$

  This gives you one parameter to deal with dependence and it allows for the kinds of marginal distributions you meet in real life. You lucky rascal, you can now compute away — having "dealt" professionally with the pesky dependence issue.

2001 and the Mortgage Market Is About to Depart Kansas

2001 and the Mortgage Market Is About to Depart Kansas

- CDO Issuance: 2004 157 B USD, 2005 251 B USD, 2006 520 B USD

2001 and the Mortgage Market Is About to Depart Kansas

- CDO Issuance: 2004 157 B USD, 2005 251 B USD, 2006 520 B USD
- Think back to how good 2006 felt

2001 and the Mortgage Market Is About to Depart Kansas

- CDO Issuance: 2004 157 B USD, 2005 251 B USD, 2006 520 B USD
- Think back to how good 2006 felt
- ... but not all was well

2001 and the Mortgage Market Is About to Depart Kansas

- CDO Issuance: 2004 157 B USD, 2005 251 B USD, 2006 520 B USD
- Think back to how good 2006 felt
- ... but not all was well
  - There really is some logic to home ownership — and home prices

2001 and the Mortgage Market Is About to Depart Kansas

- CDO Issuance: 2004 157 B USD, 2005 251 B USD, 2006 520 B USD
- Think back to how good 2006 felt
- ... but not all was well
  - There really is some logic to home ownership — and home prices
  - That "house prices do not go down" was wishful thinking

2001 and the Mortgage Market Is About to Depart Kansas

- CDO Issuance: 2004 157 B USD, 2005 251 B USD, 2006 520 B USD
- Think back to how good 2006 felt
- ... but not all was well
  - There really is some logic to home ownership — and home prices
  - That "house prices do not go down" was wishful thinking
  - CDO Issuance: 2007 481 B USD, 2008 61 B USD, and then in 2009 just 4 B USD

2001 and the Mortgage Market Is About to Depart Kansas

- CDO Issuance: 2004 157 B USD, 2005 251 B USD, 2006 520 B USD
- Think back to how good 2006 felt
- ... but not all was well
  - There really is some logic to home ownership — and home prices
  - That "house prices do not go down" was wishful thinking
  - CDO Issuance: 2007 481 B USD, 2008 61 B USD, and then in 2009 just 4 B USD
- This is what a crash looks like — in the the CDO market. The tipping point was in 2006. The equity market did not start its crash until November 2007. The economy ... we'll it stayed on the skids to 2009 Q1.

Financial Crisis 2007-2009

Financial Crisis 2007-2009

- Honest Thinking: *Ex Ante* vs *Ex Post*

Financial Crisis 2007-2009

- Honest Thinking: *Ex Ante* vs *Ex Post*
- We erased the "shadow banking system" — which was home to 500 B of activity.

Financial Crisis 2007-2009

- Honest Thinking: *Ex Ante* vs *Ex Post*
- We erased the "shadow banking system" — which was home to 500 B of activity.
- This erasure and the hit to the housing sector were serious enough to bring on two years of economic contraction.

Financial Crisis 2007-2009

- Honest Thinking: *Ex Ante* vs *Ex Post*
- We erased the "shadow banking system" — which was home to 500 B of activity.
- This erasure and the hit to the housing sector were serious enough to bring on two years of economic contraction.
- There are many tons of real economic and personal wreckage.

Financial Crisis 2007-2009

- Honest Thinking: *Ex Ante* vs *Ex Post*
- We erased the "shadow banking system" — which was home to 500 B of activity.
- This erasure and the hit to the housing sector were serious enough to bring on two years of economic contraction.
- There are many tons of real economic and personal wreckage.
- The biggest problem is underemployment — and this problem could last for decades.

Financial Crisis 2007-2009

- Honest Thinking: *Ex Ante* vs *Ex Post*
- We erased the "shadow banking system" — which was home to 500 B of activity.
- This erasure and the hit to the housing sector were serious enough to bring on two years of economic contraction.
- There are many tons of real economic and personal wreckage.
- The biggest problem is underemployment — and this problem could last for decades.
- Blame? The media has had no problem finding villains — including some like Bernie Madoff who might not have been caught in their natural lives had the "tide not gone out."

Financial Crisis 2007-2009

- Honest Thinking: *Ex Ante* vs *Ex Post*
- We erased the "shadow banking system" — which was home to 500 B of activity.
- This erasure and the hit to the housing sector were serious enough to bring on two years of economic contraction.
- There are many tons of real economic and personal wreckage.
- The biggest problem is underemployment — and this problem could last for decades.
- Blame? The media has had no problem finding villains — including some like Bernie Madoff who might not have been caught in their natural lives had the "tide not gone out."
- Lessons Learned? Well, let's stick to what quants may have learned — and may still worry about.

Quants: Responsibilities and Lessons Learned

Quants: Responsibilities and Lessons Learned

- Nobody who understands Li's model will put any blame on his shoulders. He clearly and honestly put forward a simple model that addressed a *part* of the dependence issue in CDOs. This is what modelers do.

Quants: Responsibilities and Lessons Learned

- Nobody who understands Li's model will put any blame on his shoulders. He clearly and honestly put forward a simple model that addressed a *part* of the dependence issue in CDOs. This is what modelers do.
- Li's model did not deal with the fact that *in extremes all assets become (more and more) correlated*. Many quants have brass plaques on their wall with this homily. They learned it first hand during the Russian and LTCM crisis of 1998. This is in everyone's mind — and no one's models.

Quants: Responsibilities and Lessons Learned

- Nobody who understands Li's model will put any blame on his shoulders. He clearly and honestly put forward a simple model that addressed a *part* of the dependence issue in CDOs. This is what modelers do.
- Li's model did not deal with the fact that *in extremes all assets become (more and more) correlated*. Many quants have brass plaques on their wall with this homily. They learned it first hand during the Russian and LTCM crisis of 1998. This is in everyone's mind — and no one's models.
- Keynes said: "When the facts change, I change my mind. What do you do, Sir?"

Quants: Responsibilities and Lessons Learned

- Nobody who understands Li's model will put any blame on his shoulders. He clearly and honestly put forward a simple model that addressed a *part* of the dependence issue in CDOs. This is what modelers do.
- Li's model did not deal with the fact that *in extremes all assets become (more and more) correlated*. Many quants have brass plaques on their wall with this homily. They learned it first hand during the Russian and LTCM crisis of 1998. This is in everyone's mind — and no one's models.
- Keynes said: "When the facts change, I change my mind. What do you do, Sir?"
  - The business of "originate to distribute" changed the risk characteristics of mortgages.

Quants: Responsibilities and Lessons Learned

- Nobody who understands Li's model will put any blame on his shoulders. He clearly and honestly put forward a simple model that addressed a *part* of the dependence issue in CDOs. This is what modelers do.
- Li's model did not deal with the fact that *in extremes all assets become (more and more) correlated*. Many quants have brass plaques on their wall with this homily. They learned it first hand during the Russian and LTCM crisis of 1998. This is in everyone's mind — and no one's models.
- Keynes said: "When the facts change, I change my mind. What do you do, Sir?"
  - The business of "originate to distribute" changed the risk characteristics of mortgages.
  - The ratio of median home price to median household income changed the likelihood of a national decline in housing prices

Quants: Responsibilities and Lessons Learned

- Nobody who understands Li's model will put any blame on his shoulders. He clearly and honestly put forward a simple model that addressed a *part* of the dependence issue in CDOs. This is what modelers do.
- Li's model did not deal with the fact that *in extremes all assets become (more and more) correlated*. Many quants have brass plaques on their wall with this homily. They learned it first hand during the Russian and LTCM crisis of 1998. This is in everyone's mind — and no one's models.
- Keynes said: "When the facts change, I change my mind. What do you do, Sir?"
  - The business of "originate to distribute" changed the risk characteristics of mortgages.
  - The ratio of median home price to median household income changed the likelihood of a national decline in housing prices
  - Absorption of marginal purchasers created fragile owners — so historical rates were less relevant to contemporary estimates.

Quants, the Next Problem, and the New Normal

Quants, the Next Problem, and the New Normal

- N quants where thrown up in the air and there were only N/2 boxes for the quants to fall back into.

Quants, the Next Problem, and the New Normal

- N quants where thrown up in the air and there were only N/2 boxes for the quants to fall back into.
- This had more to do with the shrinkage of the shadow banking system than with any success or failure of models.

Quants, the Next Problem, and the New Normal

- N quants where thrown up in the air and there were only N/2 boxes for the quants to fall back into.
- This had more to do with the shrinkage of the shadow banking system than with any success or failure of models.
- The biggest "quant risk" that is out there today is VAR, value at risk.

Quants, the Next Problem, and the New Normal

- N quants where thrown up in the air and there were only N/2 boxes for the quants to fall back into.
- This had more to do with the shrinkage of the shadow banking system than with any success or failure of models.
- The biggest "quant risk" that is out there today is VAR, value at risk.
  - VAR suffers from the same "peso problem" that was behind the worst inferences of CDO crisis

Quants, the Next Problem, and the New Normal

- N quants where thrown up in the air and there were only N/2 boxes for the quants to fall back into.
- This had more to do with the shrinkage of the shadow banking system than with any success or failure of models.
- The biggest "quant risk" that is out there today is VAR, value at risk.
  - VAR suffers from the same "peso problem" that was behind the worst inferences of CDO crisis
  - VAR is not counter cyclical — it encourages (even forces) herd behavior.

Quants, the Next Problem, and the New Normal

- N quants where thrown up in the air and there were only N/2 boxes for the quants to fall back into.
- This had more to do with the shrinkage of the shadow banking system than with any success or failure of models.
- The biggest "quant risk" that is out there today is VAR, value at risk.
  - VAR suffers from the same "peso problem" that was behind the worst inferences of CDO crisis
  - VAR is not counter cyclical — it encourages (even forces) herd behavior.
- To Quant or Not to Quant? My view — its a glorious life and it adds value to society!

Quants, the Next Problem, and the New Normal

- N quants where thrown up in the air and there were only N/2 boxes for the quants to fall back into.
- This had more to do with the shrinkage of the shadow banking system than with any success or failure of models.
- The biggest "quant risk" that is out there today is VAR, value at risk.
  - VAR suffers from the same "peso problem" that was behind the worst inferences of CDO crisis
  - VAR is not counter cyclical — it encourages (even forces) herd behavior.
- To Quant or Not to Quant? My view — its a glorious life and it adds value to society!
- Just don't check your common sense at the door.