The Impact of the Time-to-Close on Residential Transaction Prices

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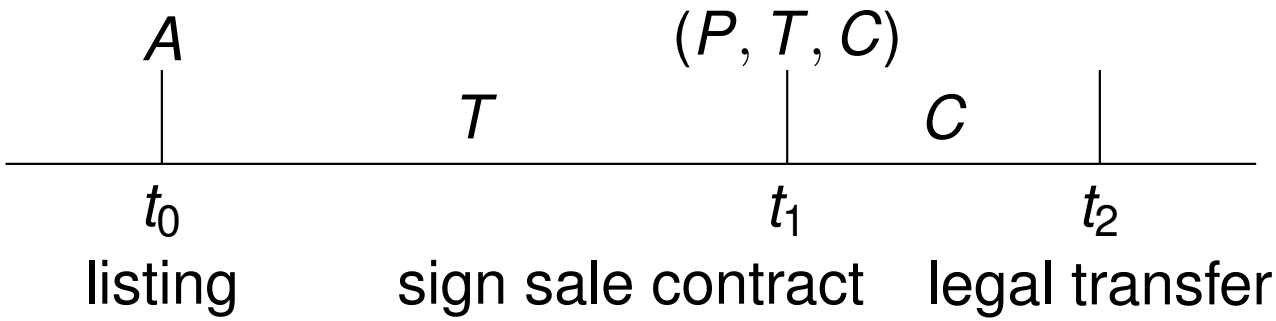
Weimer School, January 19, 2019

Introduction - C and T



- t_0: put house on market, setting of initial asking price
- t_2: date of legal transfer
- t_1: date of signing sale contract, agreement on
  - P: transaction price
  - T: time-on-market: t_1 - t_0
  - C: time-to-close: t_2 - t_1
- Research question:
  What is the relation between T and C and P?

Sale contract

- Time-to-close, why?
  - Buyer needs time to arrange finance (mortgage)
  - Physical inspection of property
- Cancellation
  - Within 3 working days (without giving any reason)
  - Otherwise, only in case of agreed cancellation clauses
    - Finance
    - Housing permit
    - National Mortgage Guarantee (NHG)
    - Physical condition
    - Approval for changing the property
    - (Selling your own house)
  - Penalty: 10% of transaction price

Impact of C on P

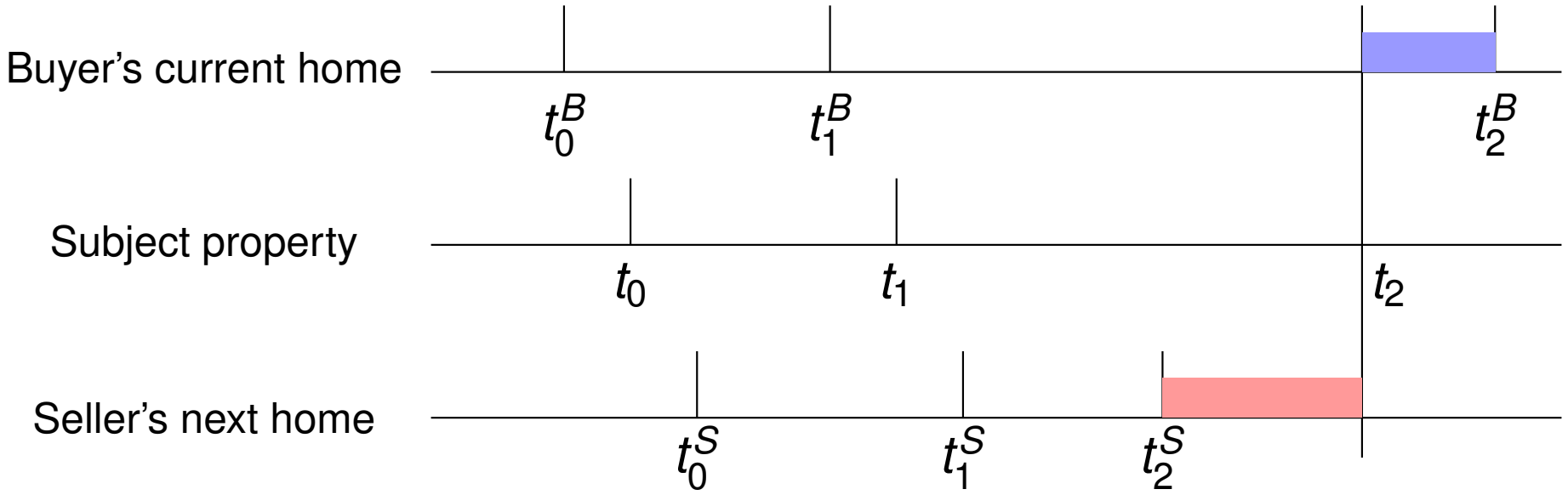
- Buyer
  - Patient:
    Buyer must sell his current home first (includes first-time-buyer)
  - Impatient:
    Buyer has sold his current home and wants to move quickly
- Seller
  - Patient: Seller still needs to buy a new home
  - Impatient: Seller already bought a new home
- Differences in bargaining power, impact on price

Buyer\Seller	Patient	Impatient
Patient		-
Impatient	+	

- Both buyer and seller want to avoid costs of owning 2 houses
- When prices are increasing, seller wants to be compensated for long C

Time-to-close

First sell, then buy



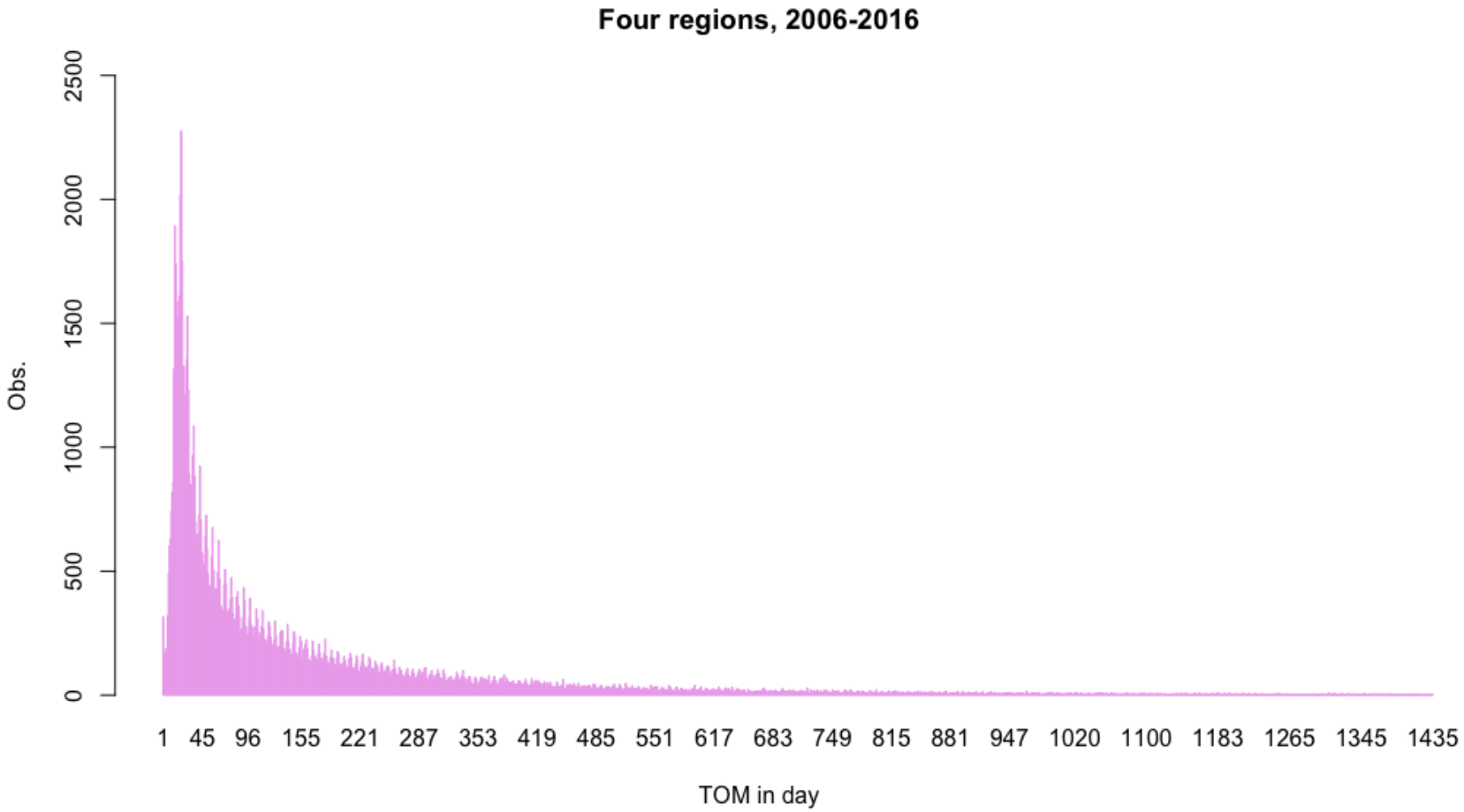
- Blue: buyer owns 2 houses; red: seller owns 2 houses

Data

- Merge two databases:
  - Dutch Brokerage Organization NVM
    - ★ date of signing sales contract
    - ★ (initial) asking price
    - ★ property characteristics
  - Land registry
    - ★ date of legal transfer
    - ★ price
    - ★ first-time-buyer (FTB)
- Sample period: 2006 – 2016
- 4 regions in the Netherlands:
  - Amsterdam: hot market
  - Hart van Brabant (Tilburg)
  - Zwolle
  - Achterhoek
- Matched sample: about 115,000 transactions

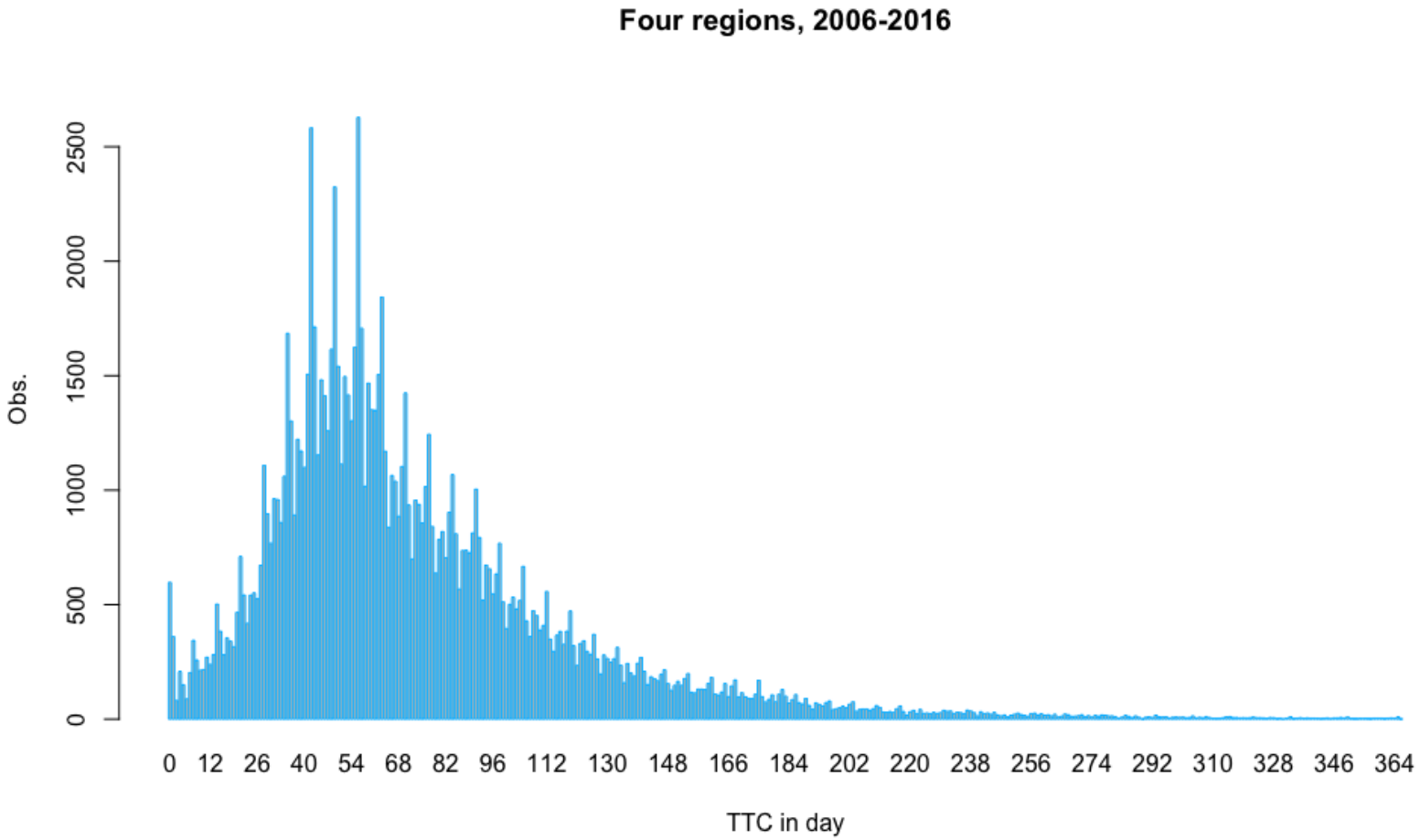
Regions within the Netherlands

Distribution of T (number of days)



- Large spread, most sold in one year.

Distribution of C (number of days)



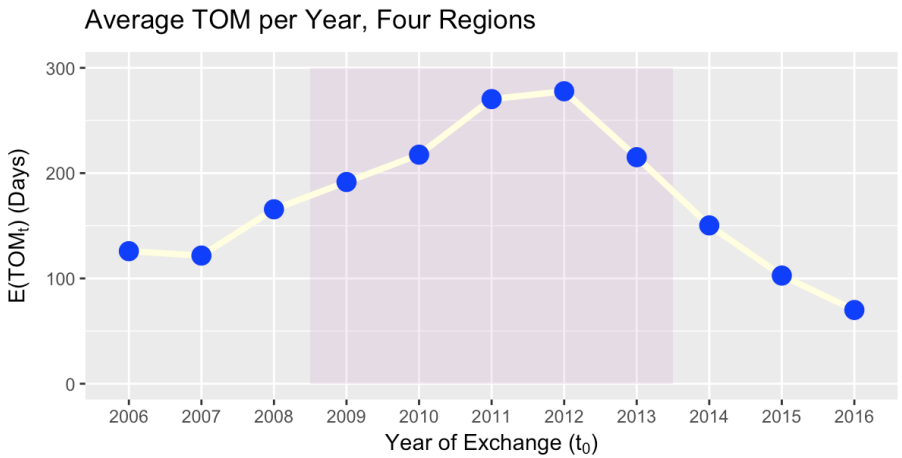
- Bit more evenly spread, small peak at zero, average at about 2 months.

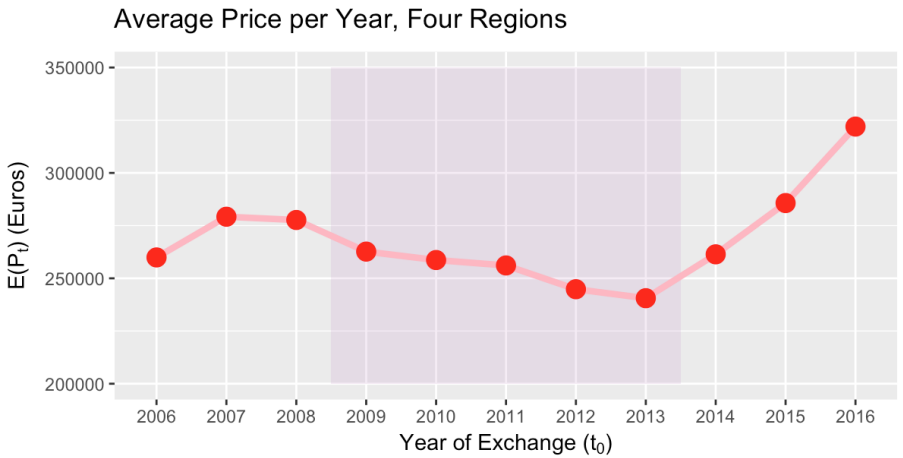
Distribution of C

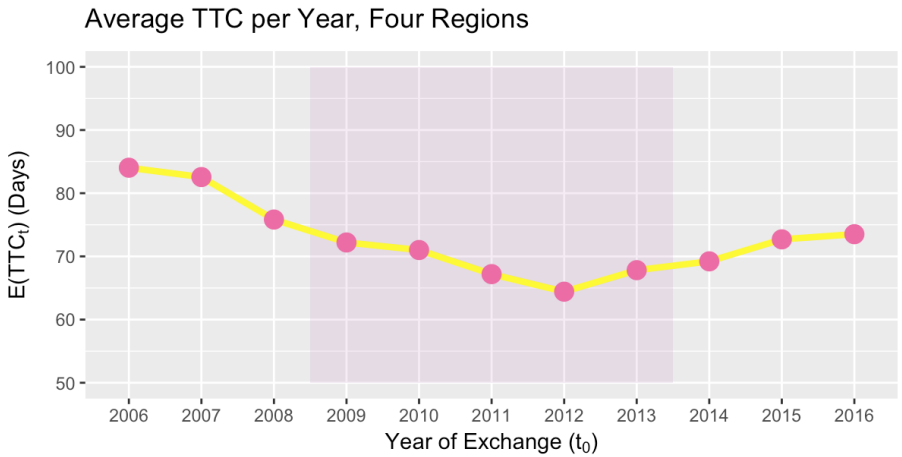
C	Frequency
0 day	0.5%
1 week	2%
1 month	11%
2 months	49%
6 months	96%

It takes about 2 months to get a mortgage...

Average (P, T, C) over years







- C does not vary much over the cycle, unlike P and T.

Regional variation in (P, T, C)

	N	Min	Median	Max	Mean	Std.Dev.
P						
Achterhoek	14,205	42,000	210,000	1,525,000	241,172	117,335
Amsterdam	61,764	60,000	231,000	4,900,000	296,814	239,987
Hart van Brabant	28,455	45,000	212,500	4,000,000	244,845	124,874
Zwolle	10,417	58,000	198,000	1,312,500	225,182	105,835
T						
Achterhoek	14,205	1	153	1,435	262	290
Amsterdam	61,764	1	49	1,433	118	176
Hart van Brabant	28,455	1	117	1,434	210	251
Zwolle	10,417	1	92	1,435	181	230
C						
Achterhoek	14,205	0	73	365	83	51
Amsterdam	61,764	0	56	365	64	39
Hart van Brabant	28,455	0	73	366	87	54
Zwolle	10,417	0	71	365	82	49

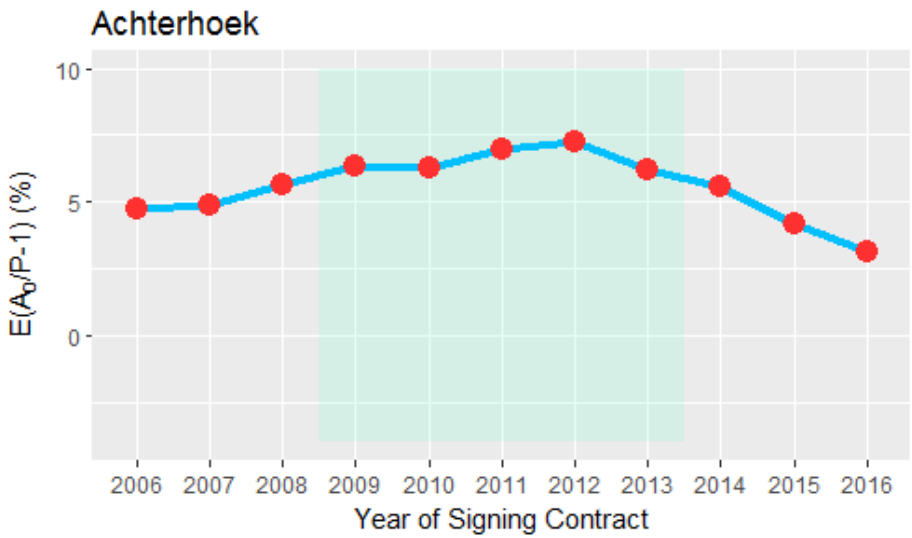
- Amsterdam is atypical; highest P, and lowest T.
- Low C is probably due to larger share of private investors (buy-to-let). No cancellation clauses

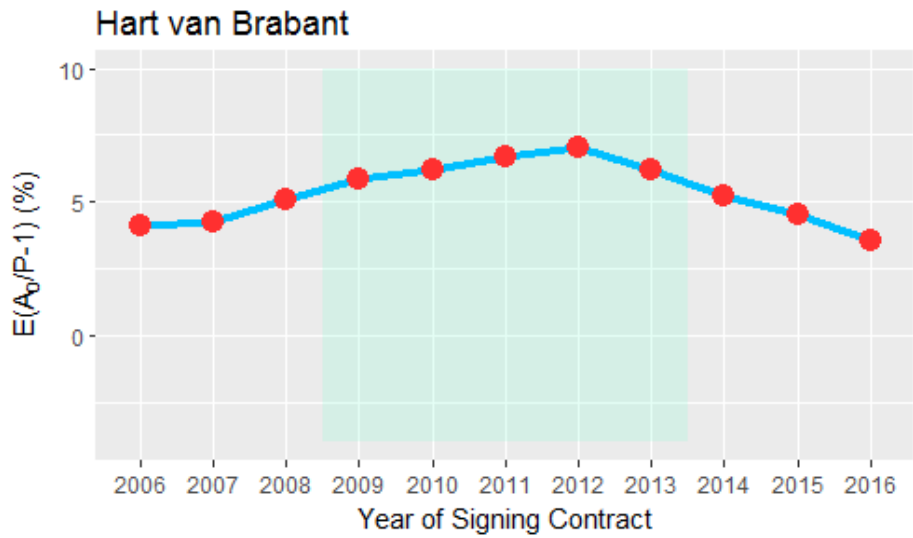
Relation between asking A and transaction price P

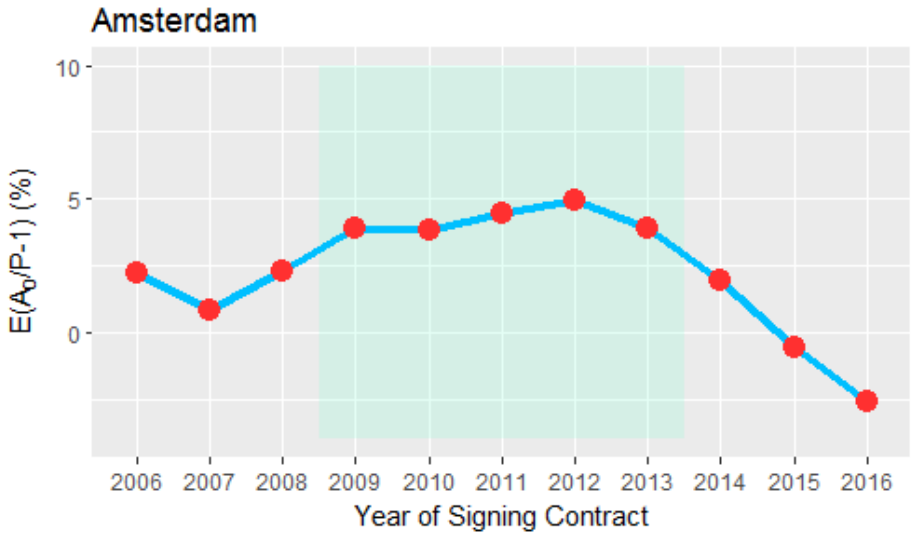
	4 regions	Achterhoek	Amsterdam	Hart van Brabant	Zwolle
			$A > P$		
Obs.	92,662	13,192	42,944	26,946	9,580
Perc.	80.7%	92.9%	69.5%	94.7%	92.0%
			$A = P$		
Obs.	7,634	631	5,471	978	554
Perc.	6.6%	4.4%	8.9%	3.4%	5.3%
			$A < P$		
Obs.	14,545	382	13,349	531	283
Perc.	12.7%	2.7%	21.6%	1.9%	2.7%

- Majority sells at price below asking price.
- Incorporate relationship between P and A in empirical framework.

Asking price to transaction price over time: $A/P - 1$







First-time-buyers (FTB)

	Min	Median	Max	Mean	Std.Dev.
All observations (114,841)					
P	42,000	220,000	4,900,000	270,557	195,923
T	1	73	1,435	165	224
C	0	62	366	73	47
Panel A: FTB (51,951)					
P	46,500	192,500	4,700,000	**219,462**	118,323
T	1	67	1,435	**150**	206
C	0	59	365	**67**	38
Panel B: non-FTB (62,890)					
P	42,000	250,000	4,900,000	**312,765**	233,649
T	1	80	1,435	**177**	237
C	0	65	366	**78**	53

- FTB should be more patient, but unconditionally have lower C (as well as T).

Control variables

Statistics	Mean	Std.Dev.	Zeros	Year	Percentage
Floor size m^2	103	49	0.06%	2006	10.4%
Lot size m^2	171	556	51.9%	2007	10.8%
No. of rooms	4	2	0.1%	2008	10.0%
Dummy variables				2009	7.8%
Construction Period				2010	7.6%
House type				2011	7.9%
Maintenance				2012	7.5%
Monument				2013	6.9%
Garden				2014	9.5%
Parking				2015	11.1%
Attic				2016	10.4%

Relation between (P, T, C)

- (P, T, C) are simultaneously determined: endogeneity
- (P, T, C) are correlated through a latent component, the motivation of sellers and buyers:
  - Literature on relation between P and T
  - Impact of C has not been studied (?)
- Boom period: high P and low T (Han and Strange, 2014)
- Asking price (A) acts as signal concerning motivation of seller (Ferreira and Sirmans, 1989; Yavas and Yang, 1995)
- A exogenous for buyer, plays a role in decision to make offer
- T depends on atypical character of house (Haurin et al., 2010)
- T depends on loan-to-value (Genesove and Mayer, 1997)

Estimation

- 2SLS approaches for either P or T:
  neglects that the determination process is simultaneous
- Knight (2002)
  - use $\hat{T}$ in equation for P, and
  - use $\hat{P}$ in equation for T
  - no instruments are being used
  - equations estimated separately ignoring correlation in error terms
- We follow Dubé and Legros (2016) and extend it to C:
  - 2SLS
  - spatial and temporal lagged instruments
    - A: initial asking prices
    - n: number of transactions
    - T: time-on-the-market
    - A/P: ratio of asking price to transaction price
  - (SUR framework)

Estimation

- First stage

$$\ln P_{i,t} = X^P_{i,t}\beta^P + Z^P_{i,t}\delta^P + \varepsilon^P_{i,t} \quad (1)$$

$$\ln T_{i,t} = X^T_{i,t}\beta^T + Z^T_{i,t}\delta^T + \varepsilon^T_{i,t} \quad (2)$$

$$\ln C_{i,t} = X^C_{i,t}\beta^C + Z^C_{i,t}\delta^C + \varepsilon^C_{i,t} \quad (3)$$

where

  - X: property characteristics, including time and location fixed effects
  - Z: instrumental variables

- Second stage

$$\ln P_{i,t} = X^P_{i,t}\beta^P + \qquad + \hat{T}_{i,t}\gamma^P + \hat{C}_{i,t}\lambda^P + \epsilon^P_{i,t} \quad (4)$$

$$\ln T_{i,t} = X^T_{i,t}\beta^T + \hat{P}_{i,t}\omega^T \qquad + \hat{C}_{i,t}\lambda^T + \epsilon^T_{i,t} \quad (5)$$

$$\ln C_{i,t} = X^C_{i,t}\beta^C + \hat{P}_{i,t}\omega^C + \hat{T}_{i,t}\gamma^C \qquad + \epsilon^C_{i,t} \quad (6)$$

Instruments

- Spatial and temporal lagged (ST) variables:
  - $t-3, \cdots, t-1$
  - within a radius of 500 meters
- Instruments
  - ln P: ST ln A, ST ln(A/P), ST ln T
  - ln T: ST ln A, ST ln(A/P), ST ln T
  - ln C: ST ln C
- Sensitivity analysis in spatial and temporal lag and instruments

Overview results

- OLS
- First stage
- Second stage
- Regional split
- FTB versus non-FTB
- Recession (2009–2013) and expansion (2006–2008, 2014–2016)

OLS results

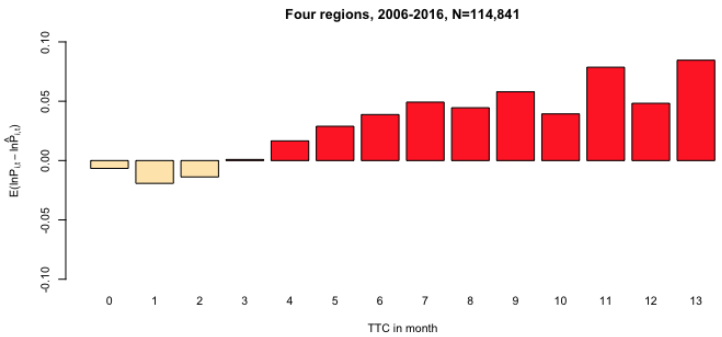
	Dependent Variable:		
	ln(P) (1)	ln(T) (2)	ln(C) (3)
ln(P)		-0.4235***	0.3938***
		(0.021)	(0.013)
ln(T)	-0.0091***		-0.0612***
	(0.000)		(0.002)
ln(C)	0.0217***	-0.1574***	
	(0.001)	(0.005)	
Control vars	Yes	Yes	Yes
Zipcode FE	Yes	Yes	Yes
Adj R^2	0.878	0.215	0.114
RMSE	0.164	1.121	0.699
F Statistic (df = 273; 108712)	2,866.395***	110.343***	52.416***

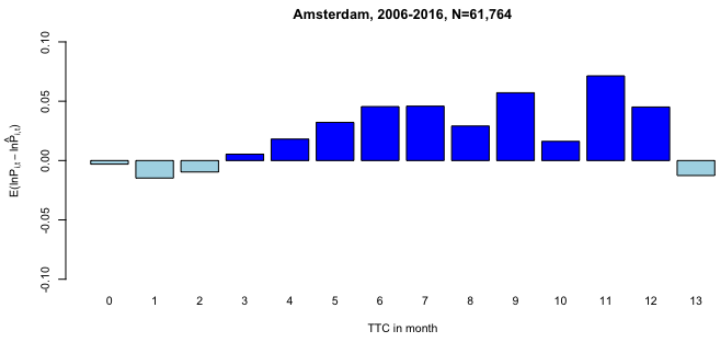
*p<0.1; **p<0.05; ***p<0.01.

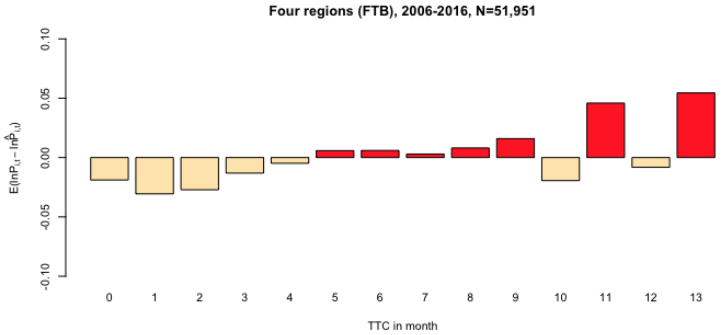
- Bi-directional relationship between T and P.
- Higher C: more P and less T.

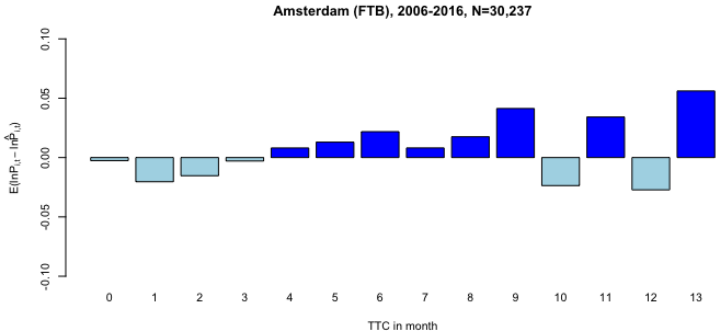
Average OLS residual by C in months

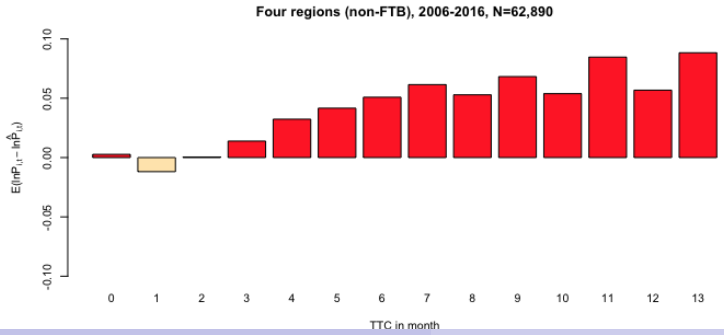
$$\ln P_{i,t} = X^P_{i,t}\beta^P + T_{i,t}\gamma^P + \epsilon^P_{i,t}$$

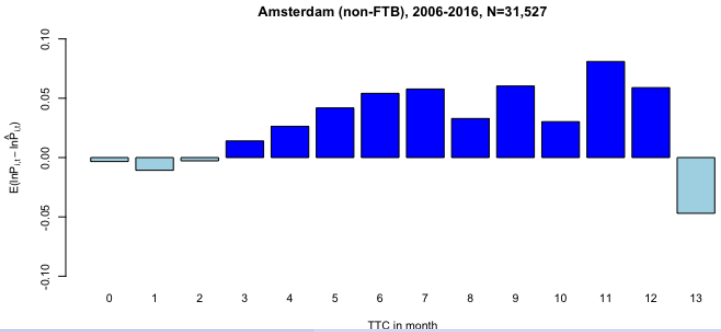












First stage Instrumental Variables

	Dependent Variable:		
	$\ln(P)$	$\ln(T)$	$\ln(C)$
	(1)	(2)	(3)
$ST \ln(A)$	0.2136^{***}	-0.0723^{***}	
	(0.0024)	(0.0170)	
$ST \ln(A/P)$	-0.2257^{***}	0.1105^{***}	
	(0.0048)	(0.0341)	
$ST \ln(T)$	-0.0215^{***}	0.1583^{***}	
	(0.0009)	(0.0062)	
$ST \ln(C)$	-0.0150^{***}		0.0725^{***}
	(0.0019)		(0.0080)
Control variables	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Zipcode FE	Yes	Yes	Yes
Adj R^2	0.8849	0.2083	0.0973
RMSE	0.1592	1.1260	0.7055
F Statistic	$3{,}060.00^{***}$	105.70^{***}	44.18^{***}

Note: $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$.

- Spatio-temporal instruments seem to work well.

Second stage Instrumental Variables

	Dependent Variable:		
	$\ln(P)$ (1)	$\ln(T)$ (2)	$\ln(C)$ (3)
$\ln \hat{P}$		-0.8300^{***}	0.0510
		(0.0795)	(0.0526)
$\ln \hat{T}$	-0.1899^{***}		-0.0131
	(0.0055)		(0.0259)
$\ln \hat{C}$	0.2801^{***}	0.2862	
	(0.0258)	(0.1818)	
Control variables	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
Zip code fixed effects	Yes	Yes	Yes
Adjusted R^2	0.8775	0.2041	0.0966
Residual Std. Error (df = 108712)	0.1643	1.1290	0.7058
F Statistic (df = 273; 108712)	$2{,}862.00^{***}$	103.40^{***}	43.69^{***}

- Dubé and Legros (2016): $\ln \hat{T} = -0.0777$ and $\ln \hat{P} = -0.8047$
- A 1 SD increase in C increases P by about 6.5 percent.

Transaction price: regional split

	Achterhoek	Amsterdam	Hart van Brabant	Zwolle	Total
			Transaction Prices		
1^{st} ***stage***					
$ST\ln(A)$	0.0486***	0.2020***	0.1050***	0.0369***	0.2136***
	(0.0058)	(0.0031)	(0.0045)	(0.0076)	(0.0024)
$ST\ln(A/P)$		−0.2080***	−0.1080***	−0.0353***	-0.2257***
		(0.0055)	(0.0285)	(0.0099)	(0.0048)
$ST\ln(T)$	−0.0091***	−0.0251***	−0.0048***	−0.0084***	-0.0215***
	(0.0018)	(0.0013)	(0.0017)	(0.0024)	(0.0009)
2^{nd} ***stage***					
$\ln(\hat{T})$	−0.2580***	−0.0675***	−0.0293	−0.0954***	-0.1899***
	(0.0362)	(0.0050)	(0.0234)	(0.0288)	(0.0055)
$\ln(\hat{C})$	0.0878	0.3620***	0.4630***	0.0390	0.2801***
	(0.1190)	(0.0379)	(0.0830)	(0.0641)	(0.0258)
Adjusted R^2	0.8450	0.9200	0.8660	0.8760	0.8775

- Quite some regional variation: Hot versus cold markets? Supply constraints?

FTB versus non-FTB: First stage

	Dependent Variable:					
	ln(P)		ln(T)		ln(C)	
	FTB	non-FTB	FTB	non-FTB	FTB	non-FTB
	(1)	(2)	(3)	(4)	(5)	(6)
ST ln(A)	0.2050***	0.2110***	−0.0643**	−0.0822***		
	(0.0034)	(0.0033)	(0.0268)	(0.0221)		
ST ln(A/P)	−0.2200***	−0.2210***	0.0954*	0.1270***		
	(0.0066)	(0.0068)	(0.0519)	(0.0454)		
ST ln(T)	-0.0216	-0.0208***	0.1800***	0.1400***		
	(0.0012)	(0.0012)	(0.0093)	(0.0083)		
ST ln(C)					0.0673***	0.0684***
					(0.0113)	(0.0112)
Control vars	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Zipcode FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	50,140	58,846	50,140	58,846	50,140	58,846
Adj R^2	0.8570	0.8880	0.1930	0.2220	0.0752	0.1180
RMSE	0.1390	0.1700	1.1000	1.1400	0.6490	0.7460

Note: *p<0.1; **p<0.05; ***p<0.01.

- FTB and non-FTB not so much different response to instruments.

FTB versus non-FTB: Second stage

	Dependent Variable:					
	ln(P)		ln(T)		ln(C)	
	FTB	non-FTB	FTB	non-FTB	FTB	non-FTB
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(\hat{P})$			−1.0800***	−0.7420***	−0.0803	0.1110
			(0.1300)	(0.1050)	(0.0803)	(0.0737)
$\ln(\hat{T})$	−0.1510***	−0.2330***			−0.0473	0.0200
	(0.0066)	(0.0088)			(0.0322)	(0.0411)
$\ln(\hat{C})$	0.3390***	0.2440***	1.2100***	−0.2640		
	(0.0374)	(0.0386)	(0.2950)	(0.2590)		
Control var	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Zipcode FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	50,140	58,846	50,140	58,846	50,140	58,846
Adj R^2	0.8488	0.8831	0.1975	0.2309	0.0879	0.1370
RMSE	0.1432	0.1739	1.0970	1.1370	0.6444	0.7380

Note: *p<0.1; **p<0.05; ***p<0.01.

- Surprisingly higher C has higher effect on P for FTB. Wealth considerations?

Recession and expansion: First stage

	Dependent Variable:					
	ln(P)		ln(T)		ln(C)	
	Recession	Expansion	Recession	Expansion	Recession	Expansion
	(1)	(2)	(3)	(4)	(5)	(6)
ST ln(A)	0.1120***	0.2570***		−0.0650***		
	(0.0038)	(0.0031)		(0.0202)		
ST ln(A/P)	−0.1120***	−0.3270***		0.1980***		
	(0.0058)	(0.0111)		(0.0728)		
ST ln(T)	−0.0053***	−0.0225***	0.0723***	0.1580***		
	(0.0013)	(0.0012)	(0.0106)	(0.0081)		
ST ln(C)					0.0323**	0.0680***
					(0.0130)	(0.0104)
Control vars	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Zipcode FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	41,141	67,845	41,141	67,845	41,141	67,845
Adj R^2	0.8900	0.8850	0.1040	0.1990	0.0694	0.1120
RMSE	0.1500	0.1610	1.2100	1.0600	0.7110	0.7010

Note: *p<0.1; **p<0.05; ***p<0.01.

Recession and expansion: Second stage

	Dependent Variable:					
	ln(P)		ln(T)		ln(C)	
	Recession	Expansion	Recession	Expansion	Recession	Expansion
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(\hat{P})$			−0.2750	−0.5030***	0.0665	0.0689
			(0.2830)	(0.0802)	(0.1620)	(0.0540)
$\ln(\hat{T})$	−0.0443**	−0.1990***			0.0500	−0.1100***
	(0.0182)	(0.0077)			(0.0856)	(0.0337)
$\ln(\hat{C})$	0.3610***	0.4790***	0.7760	−0.4830**		
	(0.0856)	(0.0371)	(0.7020)	(0.2420)		
Control vars	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Zipcode FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	41,141	67,845	41,141	67,845	41,141	67,845
Adj R^2	0.8870	0.8750	0.1030	0.1950	0.0693	0.1110
RMSE	0.1510	0.1690	1.2200	1.0600	0.7110	0.7010

Note: *p<0.1; **p<0.05; ***p<0.01.

- During an expansion waiting longer to 'close the deal' (C) is more costly.

Conclusion

- C has positive effect on P : important to include in HPM
- C has larger effect on P for the FTB than for the non-FTB (counter-intuitive from patient / impatient)
- C has larger effect on price during expansions than recessions

Some to do's:

- continuous measure of impatience: exploit information of buyer and seller
- cost versus benefit of waiting (channels)
- ...

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