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Margin rate and the cycle: the role of trade openness[1]

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[1] The views expressed in this paper do not necessarily reflect Banque de France's or Eurosystem's opinion.

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Abstract

Using three datasets of French manufacturing firms, this paper studies the role of trade openness, in relation with the cycle, as a determinant of company margin rate. Margin rates increase as capacity utilization tightens (and vice versa), reflecting the procyclicality of margin rates. However, high import rates are limiting this procyclicality: when capacities are tight, domestic producers may not be able to serve demand, but foreign producers may substitute for them if they are already present on the market as reflected by the level of import rates.

JEL codes: D24, D43, E32

Keywords: margin rates, capacity utilization, cycle, trade openness

Résumé

Utilisant trois bases de données sur les entreprises françaises du secteur manufacturier, ce papier étudie le rôle de l'ouverture commerciale, en lien avec le cycle, comme déterminant des taux de marge des entreprises. Les taux de marge augmentent quand l'utilisation des capacités se tend (et vice versa), reflétant la procyclicité des taux de marge. Cependant, des taux d'import élevés limitent cette procyclicité : quand l'utilisation des capacités est tendue, les producteurs nationaux ne peuvent répondre à la demande, mais les producteurs étrangers peuvent se substituer à eux s'ils sont déjà présents sur le marché, ce qui est reflété par le niveau des taux d'import.

JEL codes: D24, D43, E32

Keywords: taux de marge, utilisation des capacités de production, cycle, ouverture commerciale

Non technical summary

The procyclicality of mark-ups and margin rates is debated, both on theoretical and empirical grounds. Theoretically, in upswings, several factors may lead to lower mark-ups: factor adjustment costs may be more cyclical and hence increase more than prices; competition may be strengthened by increased firm entry or lower incentives to collude. However, tensions on capacity utilization in upswings may also lead to higher mark-ups: as capacity constrained firms can no longer provide the market shares they would gain by undercutting competitors' prices, they compete on quantities, which yields higher profits. Empirical results are mixed, some supporting procyclicality (Haskel and Martin, 1994, Haskel, Martin and Small, 1995, Aiginger and Weiss 1998, Lima and Resende, 2004) and others countercyclicality (Galeotti and Schiantarelli, 1998, Oliveira Martins and Scarpetta, 2002).

Trade openness weighs on margin rates as domestic firms face more competitive pressure from foreign competitors. In relation with the cycle, the role of openness is more ambiguous. On the one hand, openness is an indicator of competition and could be analyzed as concentration ratios: the impact of greater openness and hence stronger competition is more limited when capacity is constrained. On the other hand, greater openness means that foreign competitors have entered the domestic market and may serve the demand that cannot be served by domestic firms. Hence, in upswings, foreign competitors may not be capacity constrained and could undercut domestic firm prices. Empirical results show usually a negative impact of openness and a positive impact of concentration on mark-ups (see for example Conyon and Machin, 1991, Aiginger and Weiss 1998).

This paper studies the role of trade openness, in relation with the cycle, as a determinant of company margin rate (earnings before interest, taxes, depreciation and amortization over value added). As new emerging countries entered the global market, trade openness grew in most countries over the past decades. The impact of this globalization process on prices, wages and eventually on margin rates has been only partially addressed in the literature. Globalization may alter both the nature of competition, the formation of wages and commodity supply elasticity, which are all determinants of margin rates. We investigate here the impact of trade openness on the cyclical behavior of margin rates, a subject which remained to be explored.

The main contribution of this paper is to assess the impact on margin rates of the interaction between the cycle and openness. Using three datasets of French manufacturing firms, we identify and assess here the procyclicality of margin rates, highlighting a positive relationship between margin rates and capacity utilization rates. Regarding the role of trade openness, we find that higher openness depresses margin rates. This impact even increases with the capacity utilization rates, as evidenced by the negative impact of the interaction of import rates and capacity utilization rates on margin rates. High import rates are limiting the procyclicality of the margin rates: when capacities are tight, domestic producers may not be able to serve demand, but foreign producers may substitute for them if they are already present on the market as reflected by the level of import rates.

These results imply that, everything else equal, the level of rents and of prices are linked positively to the cycle and negatively to trade openness. For this reason, in addition to other channels, the stabilization role of monetary policy could have an impact on price through the margin rate channel, which is reduced by trade openness. And structural reforms which lower foreign barriers to entry may increase trade openness. These results highlight how monetary policies, structural reforms and possible interactions between these two kinds of policies may impact prices.

1. Introduction

The procyclicality of mark-ups and margin rates is debated, both on theoretical and empirical levels (see Nekarda and Ramey, 2013, for a survey). And cyclicality depends itself, among other factors, on average growth and the average share of fixed costs in total cost (see Kwon Lee, 2004). In New Keynesian models, with sticky prices and flexible wages, countercyclical mark-ups are a key assumption for the transmission of demand shocks.[3] Theoretically, in upswings, greater cyclicality in factor adjustment costs than in prices, increased firm entry or lower incentives to collude may lead to lower mark-ups. However, tensions on capacity utilization in upswings may also lead to higher mark-ups as the competition regime evolves from Bertrand to Cournot: as capacity constrained firms can no longer provide the market shares they would gain by undercutting competitors' prices, they compete on quantities, which yields higher profits. Empirical results are mixed, some supporting procyclicality (Haskel and Martin, 1994, Haskel, Martin and Small, 1995, Aiginger and Weiss 1998, Lima and Resende, 2004) and others countercyclicality (Galeotti and Schiantarelli, 1998, Oliveira Martins and Scarpetta, 2002).

Trade openness weighs on margin rates as domestic firms face more competitive pressure, from foreign competitors.[4] In relation with the cycle, the role of openness is more ambiguous. On the one hand, openness is an indicator of competition and could be analyzed as concentration ratios[5]: the impact of greater openness and hence stronger competition is more limited when capacity is constrained as the market turns to Cournot-style competition. On the other hand, greater openness means that foreign competitors have entered the domestic market and may serve the demand that cannot be served by domestic firms. Hence, in upswings, the margin rates of domestic firm may benefit less from Cournot-style competition in more opened markets as foreign competitors may not be capacity constrained and could undercut domestic firm prices. Empirical results show usually a negative impact of openness and a positive impact of concentration on mark-ups (see for example Conyon and Machin, 1991, Aiginger and Weiss 1998).

This paper studies the role of trade openness, in relation with the cycle, as a determinant of company margin rate. As new emerging countries entered the global market, trade openness grew in most countries over the past decades. The impact of this globalization process on prices, wages and eventually on margin rates has been only partially addressed in the literature. Globalization may alter both the nature of competition, the formation of wages and commodity supply elasticity, which are all determinants of margin rates (Barnea and Kim, 2007). Its impact may evolve through time as emerging countries evolve upwards in the commodity trade structure (Xing and Xu, 2014). We investigate here the impact of trade openness on the cyclical behavior of margin rates, a subject which remained to be explored.

The main contribution of this paper is to assess the impact on margin rates of the interaction between the cycle and openness. Using three datasets of French manufacturing firms and OLS/2SLS estimations, we confirm here the procyclicality of margin rates, with a positive relationship between margin rates and

[3] In some specific activities, the margin rate depends on specific aspects. Barnea and Moshe (2007) show for example that in the oligopolistic banking industry, the changes of the margin rate depends both on dynamic oligopolistic conduct dynamics of market fundamentals.

[4] Trade liberalisation changes competitive pressures, by itself and also through complementary policies which may be needed (see Moore, 2010, for example on capital account liberalisation and the banking industry). And the trade structure depends itself on various factors, as regulations but also as shown by Xing and Xu (2014), on saving rate level.

[5] Haskel and Martin (1994), for example, aggregate concentration ratios and import rates in "Adjusted concentration ratios". Interestingly, the interaction term between their cyclical term and this "Adjusted concentration ratio" is not any longer significant, which is consistent with our results: import rates in interaction with the cycle have an impact on margin rates, that is of opposite sign to the one of concentration ratios, which may explain why mixing both indicators yields non-significant results.

capacity utilization rates. Regarding the role of trade openness, we find that higher openness depresses margin rates. This impact even increases with the capacity utilization rates, as evidenced by the negative impact of the interaction of import rates and capacity utilization rates on margin rates. High import rates are limiting the procyclicality of the margin rates: when capacities are tight, domestic producers may not be able to serve demand, but foreign producers may substitute for them if they are already present on the market as reflected by the level of import rates.

Section 2 presents the data and the estimated model, Section 3 comments the main estimate results and some robustness checks and Section 4 concludes.

2. Data and estimation framework

2.1. The data

Our study is based on three original and rich French individual datasets constructed by the Banque de France: the FiBEn database, the Factor Utilisation Degree Survey (FUDS) and the Survey on Manufacturing Industry (SMI).

FiBEn is a very large individual company database that includes balance sheets and profit and loss accounts from annual tax statements. It features all French firms with sales exceeding €750,000 per year or with a credit outstanding higher than €380,000. This database allows for computing the margin rate (*MR*), the capital stock (*K*) and the intermediate consumption to capital stock ratio (*IC*).

The Factor Utilisation Degree Survey (FUDS) has been carried out every September since 1989 by the Banque de France at the plant level. 1,500 to 2,500 plants are covered by this survey, depending on the year. This dataset directly provides for each plant the annual growth rate of capital workweek (*HK*), the percentage of employees organised in shift work and the production capacity utilisation rate (*CUR*).

The Survey on Manufacturing Industry (SMI) is carried out by the branches of the Banque de France from a sample of approximately 9,000 companies. This dataset provides a direct measure of the production capacity utilisation rate (*CUR*).

As *CUR* may be potentially prone to measurement biases, which is quite standard in firm-level panel data, we use the two different measures of this variable provided by the two surveys mentioned above. Thus, two datasets have been created by merging each of these two surveys with the FiBEn database. Although it is poorly measured overall, *CUR* is better computed in the sample resulting from the merger of the FiBEn database and the SMI sample (FiBEn-SMI sample, which is unbalanced and containing 31,962 observations over the period 1996-2012[6]) than in the dataset obtained by combining the FUDS sample and the FiBEn database (FiBEn-FUDS sample, which is also an unbalanced dataset of 22,266 observations over the period 1989-2012). However, the FiBEn-FUDS sample contains some variables like shift work dummy and past change in capital operating time which can be useful to instrument *CUR*. To simplify, we note thereafter FUDS and SMI for the FiBEn-FUDS and FiBEn-SMI samples. Descriptive statistics of our main variables can be found in Table A1 in Appendix.

We performed unit root tests on *MR* and *CUR,* which do not reject their stationarity (see Table A2 in Appendix).

6 The SMI sample is available only from 1996.

2.2. The model

We estimate the following equation:

$$MR_{ijt} = \alpha + \beta_1.CUR_{ijt} + \beta_2.IR_{jt} + \beta_3.CUR_{ijt} \times IR_{jt} + D_t + \delta_i + \varepsilon_{ijt}$$

With MR_{ijt}, the margin rate; CUR_{ijt}, capacity utilization rate; IR_{jt}, the import rate (provided by national accounts data); D_t, year fixed effects; δ_i, firm fixed effects; ε_{ijt}, the error term; *i*, for firms, *j*, for sectors and *t* for years.

Year fixed effects stand for aggregate conditions, i.e. cyclical conditions, labor market changes and structural evolutions; firm fixed effects for firm and sector time-invariant conditions such as management quality or capital intensity. CUR reflects firm-level cyclical evolutions, as factor utilization is the firm's main adjustment tool to demand shocks (Cette *et alii*, 2014): β_1 could be either positive or negative, according to the literature. IR reflects international competition faced in a specific branch: β_2 is expected to be negative (cf. Conyon and Machin, 1991). IR variance is however almost fully (at 97%) explained by year and firm dummies; due to this multicollinearity, it has to be dropped from the equation. $CUR \times IR$ may reflect the non-linearity in the impact of CUR for firms in highly competitive sectors: when capacity is constrained, firms will not try to undercut their competitors' prices as they cannot serve demand, and competition will rely on quantities produced (Cournot competition), which is more favorable to profits ($\beta_3 > 0$). However, $CUR \times IR$ may also reflect the fact that foreign competitors in more-opened sectors may serve demand when domestic capacities are constrained and weigh on domestic firm profits ($\beta_3 < 0$).

We assume that the firm-specific effect δ_i is correlated with the explanatory variables. To estimate the model, we use the within transformation, so that estimation is consistent. CUR is subject to measurement errors as we detect accumulation points at round figures and endogeneity due to omitted variables. Hence, we instrument CUR and $CUR \times IR$ with intermediate consumption to capital stock ratio (*IC*) for all regressions, shift work dummy and past change in capital operating time for FUD regressions and lagged change in *CUR* for SMI regressions. *IC* yields a continuous measure of factor utilization and corrects for measurement errors. Specific instruments available for FUDS regressions, which reflect the firm's production organization and expectations, are much more accurate than for SMI regressions, which are Anderson-Hsiao style instruments.

3. Results and robustness

Table 1 presents the main estimation results. It appears that the estimated *CUR* coefficient (β_1) is positive and always significant, which means that the margin rate increases with the capacity utilization rate. The estimated coefficient does not change when $CUR \times IR$ is introduced in the relation. Considering that 2SLS estimates correct *CUR* measurement errors biases and endogeneity possible biases, it appears from those estimates that a 1 percentage point change in *CUR* would change the margin rate in the same direction by 0.44 point (SMI estimate) to 0.65 point (FUDS estimate). As the FUDS dataset probably gives, from more accurate instruments, a better estimate of the *CUR* coefficient, the real influence of the capacity utilization rate on the margin rate is probably closer to the upper bound (0.65) of the interval than to the lower one (0.44).

The estimated coefficient of the interacted variable $CUR \times IR$ is not significant in the SMI estimates but is significant and negative on the FUDS ones. For the reasons given above, these FUDS estimates seem to us more relevant than the SMI ones. Considering the 2SLS estimate result, it appears that 1 percentage point change in $CUR \times IR$ would change the margin rate in the opposite direction by 0.15 point. Hence, the prevalent explanation is that importers substitute for domestic producers when domestic capacities are tight and hence limit the positive impact of tight capacities on margins in sectors where importers are well settled. At the 85% median *CUR* value, it means that a 1 percentage point difference in the import rate *IR* would change in the opposite direction the margin rate by 0.13 point. The *IR* interquartile interval is 12 pp in the SMI dataset and 16 pp in the FUDS one, and consequently the possible influence of the *IR* variable appears very large.

Table 1: **Main results**

Explanatory variables	CUR				CUR and $CUR \times IR$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Est..method	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Sample	FUDS	FUDS	SMI	SMI	FUDS	FUDS	SMI	SMI
CUR	**0.105******	**0.647******	**0.337******	**0.444******	**0.143******	**0.691******	**0.325******	**0.469******
	(0.00925)	(0.0605)	(0.0111)	(0.0249)	(0.0176)	(0.0642)	(0.0197)	(0.0324)
$CUR \times IR$	**-**	**-**	**-**	**-**	**-0.133****	**-0.154***	**0.0386**	**-0.0845**
					(0.0523)	(0.0816)	(0.0505)	(0.0665)
Hansen p-value	-	**0.203**	-	**0.396**	-	**0.207**	**-**	**0.583**

Standard errors in parentheses. *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$; ****: $p < 0.001$.
All regressions with firm fixed effects, year dummies and firm-level clustered t-stat over the FUDS sample (22,266 observations) or the SMI sample (31,962). Instruments used for 2SLS regressions: intermediate consumption to capital stock ratio for all regressions, import rate for columns (6) and (8), shift work dummy, past change in capital operating time for columns (2) and (6), lagged change in *CUR* for columns (4) and (8).

We tested the robustness of table 1 to alternative estimation techniques, using random effects[7] instead of fixed effects. Results are fully consistent in sign and size with fixed effects estimation, apart from columns 7 and 8: contrary to Table 1, results on the SMI sample are fully consistent with FUDS sample results (see Table 2). Hausman tests however do not support the use of random effects, but for columns (2), (6) and (8). Hence, the result of a negative impact of the interaction $CUR \times IR$ is comforted on random effect estimates.

Table 2: **Robustness to alternative estimation techniques: Random effects**

Explanatory variables	CUR				CUR and $CUR \times IR$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Est..method	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
Sample	FUDS	FUDS	SMI	SMI	FUDS	FUDS	SMI	SMI
CUR	**0.113******	**0.726******	**0.335******	**0.442******	**0.173******	**0.790******	**0.392******	**0.521******
	(0.0059)	(0.0471)	(0.00678)	(0.0242)	(0.0082)	(0.0474)	(0.0088)	(0.0254)
$CUR \times IR$	**-**	**-**	**-**	**-**	**-0.214******	**-0.234******	**-0.174******	**-0.247******
					(0.0202)	(0.0268)	(0.0177)	(0.0188)
Hausman p-value	**0.0000**	**0.5884**	**0.0000**	**0.0000**	**0.0000**	**0.5375**	**0.0000**	**0.1590**

Standard errors in parentheses. *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$; ****: $p < 0.001$.
All regressions with random effects and year dummies. Instruments used for 2SLS regressions: intermediate consumption to capital stock ratio for all regressions, import rate for columns (6) and (8), shift work dummy, past change in capital operating time for columns (2) and (6), lagged change in *CUR* for columns (4) and (8).

Next, we tested the robustness of results in columns 6 and 8 of table 1 to alternative specifications, removing year dummies and firm fixed effects. FUDS results are not altered by these changes in terms of signs or significance of the coefficients, but $CUR \times IR$ in SMI results are now significant, negative and of a similar

[7] We also tested the robustness to the use of system GMM estimators. Results are consistent in sign and significance but the Hansen tests do not support the use of this estimation technique.

size as in FUDS results (see Table 3). Estimates on a shorter 1998-2012 period for the FUD sample gives the same results, but the $CUR \times IR$ coefficient is not significant. When removing sectors one by one from the sample, FUDS results are not altered in signs or size but the coefficient of $CUR \times IR$ is not always significant, and SMI results are also not altered in signs or size but the coefficient of $CUR \times IR$ appears now sometimes significant (see Table 4). These estimates confirm the robustness of the Table 1 column 6 and 8 results.

Table 3: **Robustness to alternative specifications**

	(1)	(2)	(3)	(4)	(5)
Specification	Without year dummies		Without firm fixed effects		1998-2012
Sample	FUDS	SMI	FUDS	SMI	FUDS
CUR	0.740****	0.546****	1.068****	0.530****	0.806****
	(0.0535)	(0.0235)	(0.0791)	(0.0288)	(0.109)
CUR X IR	-0.170**	-0.308****	-0.268****	-0.267****	-0.194
	(0.0670)	(0.0515)	(0.0346)	(0.0243)	(0.131)
Hansen p-value	0.0513	0.489	0.246	0.317	0.985

Standard errors in parentheses. *: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$; **** $p < 0.001$.
All regressions in 2SLS with firm fixed effects, year dummies and firm-level clustered t-stat. A constant is included but not reported. Instruments used: intermediate consumption to capital stock ratio and import rate for all regressions, shift work dummy, past change in capital operating time for columns (1), (3) and (5), lagged change in *CUR* for columns (2) and (4).

Table 4: **Robustness to sector exclusion, FiBEn-FUDS sample**

Without…	CA- Food products	CB - Textiles	CC - Wood and paper	CE - Chemicals	CF - Pharmaceuticals	CG – rubber and plastics	CH – metal products	CI – Electronic products	CJ – electrical equipments	CK - machinery and equipment	CL – transport equipments	CM – other manuf.
CUR	0.728****	0.672****	0.736****	0.691****	0.691****	0.682****	0.638****	0.706****	0.671****	0.690****	0.685****	0.681****
	(0.0677)	(0.0676)	(0.0685)	(0.0655)	(0.0645)	(0.0691)	(0.0724)	(0.0642)	(0.0644)	(0.0719)	(0.0667)	(0.0696)
CUR X IR	-0.157*	-0.120	-0.184**	-0.147*	-0.159*	-0.148*	-0.135	-0.192**	-0.161*	-0.155	-0.112	-0.135
	(0.0840)	(0.0966)	(0.0828)	(0.0834)	(0.0820)	(0.0857)	(0.0910)	(0.0827)	(0.0843)	(0.107)	(0.0861)	(0.103)
N	19,608	20,353	18,842	21,363	22,088	20,158	17,551	21,485	21,553	20,305	21,436	20,138
Hansen p-value	0.0149	0.258	0.230	0.130	0.173	0.287	0.315	0.169	0.289	0.255	0.255	0.198

Standard errors in parentheses. *: p < 0.1; **: p < 0.05; ***: p < 0.01; **** p < 0.001.

Standard errors in parentheses; * p < 0.1, ** p < 0.05, *** p < 0.01, **** p < 0.001. All regressions in 2SLS with firm fixed effects, year dummies and firm-level clustered t-stat. A constant is included but not reported. Instruments used: intermediate consumption to capital stock ratio and import rate, shift work dummy and change in capital operating time.

Table 5: **Robustness to sector exclusion, FiBEn-SMI sample**

Without…	CA- Food products	CB - Textiles	CC - Wood and paper	CE - Chemicals	CF - Pharmaceuticals	CG – rubber and plastics	CH – metal products	CI – Electronic products	CJ – electrical equipments	CK - machinery and equipment	CL – transport equipments	CM – other manuf.
CUR	0.498***	0.458***	0.489***	0.467***	0.474***	0.477***	0.478***	0.468***	0.472***	0.439***	0.450***	0.474***
	(0.0352)	(0.0335)	(0.0337)	(0.0327)	(0.0325)	(0.0346)	(0.0360)	(0.0337)	(0.0332)	(0.0360)	(0.0341)	(0.0387)
CUR X IR	-0.0509	-0.0651	-0.117*	-0.0569	-0.0844	-0.0782	-0.142**	-0.0925	-0.0983	-0.0606	-0.0709	-0.101
	(0.0670)	(0.0701)	(0.0668)	(0.0675)	(0.0674)	(0.0697)	(0.0713)	(0.0745)	(0.0687)	(0.0821)	(0.0713)	(0.0889)
N	27,266	29,421	27,883	30,234	31,564	28,687	26,646	30,841	30,812	28893	30321	28974
jp	0.00599	0.849	0.598	0.659	0.581	0.624	0.414	0.694	0.709	0.976	0.750	0.758

Standard errors in parentheses. *: p < 0.1; **: p < 0.05; ***: p < 0.01; **** p < 0.001.
. All regressions in 2SLS with firm fixed effects, year dummies and firm-level clustered t-stat. A constant is included but not reported. Instruments used: intermediate consumption to capital stock ratio and import rate, lagged change in *CUR*.

4. Conclusion

The procyclicality of margin rates has been confirmed here on French manufacturing firm-level data, this procyclicality being reduced by trade openness. Competition may impact margin rates through these two different channels. The pressure from competition on margin rates decreases with the tightness of the cyclical situation and increases with trade openness. It means that, everything else equal, the level of rents and of prices are linked positively to the cycle and negatively to trade openness. For this reason, in addition to other channels, the stabilization role of monetary policy could have an impact on price through the margin rate channel, which is reduced by trade openness. And structural reforms which lower foreign barriers to entry may increase trade openness. These results highlight how monetary policies, structural reforms and possible interactions between these two kinds of policies may impact prices.

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Appendix

Table A1: **Descriptive statistics**

Variable	Description	Unit	Source	P10	Q1	Mean	Median	Q3	P90	Std Error
MR	Margin Rate	%	FiBEn-FUDS	4.49	15.14	26.79	25.86	37.33	48.93	16.38
			FiBEn-SMI	0.00	13.48	26.81	26.37	38.89	50.13	17.72
CUR	Capacity Utilization Rate	%	FiBEn-FUDS	60.00	75.00	81.02	85.00	90.00	97.00	15.08
			FiBEn-SMI	65.00	74.09	81.39	82.73	90.45	96.36	12.38
IR	Import Rate	%	FiBEn-FUDS	16.28	20.04	27.25	23.95	32.76	43.34	10.81
			FiBEn-SMI	16.28	22.33	30.28	25.76	38.54	47.84	12.22

Table A2: **Unit root tests**

Variable	MR	CUR	$CUR \times IR$
FUDS sample			
Inverse χ^2	**1.24e+04**	**1.30e+04**	**1.49e+04**
p-value	0.0000	0.0000	0.0000
SMI sample			
Inverse χ^2	**1.00e+04**	**9785.0156**	**1.02e+04**
p-value	0.0000	0.0000	0.0000

Choi (2001) tests based on Philips-Perron (PP) tests.

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