Mathematics > Probability

Asymptotic expansion of beta matrix models in the one-cut regime

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(Submitted on 6 Jul 2011 (v1), last revised 12 Nov 2012 (this version, v3))

We prove the existence of a 1/N expansion to all orders in beta matrix models with a confining, off-critical potential corresponding to an equilibrium measure with a connected support. Thus, the coefficients of the expansion can be obtained recursively by the "topological recursion" of Chekhov and Eynard. Our method relies on the combination of a priori bounds on the correlators and the study of Schwinger-Dyson equations, thanks to the uses of classical complex analysis techniques. These a priori bounds can be derived following Boutet de Monvel, Pastur and Shcherbina, or for strictly convex potentials by using concentration of measure. Doing so, we extend the strategy of Guionnet and Maurel-Segala, from the hermitian models (beta = 2) and perturbative potentials, to general beta models. The existence of the first correction in 1/N has been considered previously by Johansson and more recently by Kriecherbauer and Shcherbina. Here, by taking similar hypotheses, we extend the result to all orders in 1/N.

Comments:	42 pages, 2 figures. v2: typos and a confusion of notation corrected. v3: version to appear in Commun. Math. Phys
Subjects:	**Probability (math.PR)**; Mathematical Physics (math-ph)
Cite as:	**arXiv:1107.1167 [math.PR]**
	(or **arXiv:1107.1167v3 [math.PR]** for this version)

Submission history

From: Gaëtan Borot [view email]
[v1] Wed, 6 Jul 2011 15:56:39 GMT (167kb,D)
[v2] Mon, 12 Sep 2011 16:05:02 GMT (167kb,D)
[v3] Mon, 12 Nov 2012 16:07:51 GMT (166kb,D)

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